

162-12.

tile

# NATCO

## WALL CONSTRUCTION



BULLETIN No. 174

*hollow tile*

A.I.A. File Number 10a11  
Block Construction  
A.I.A. File Number 3h  
Masonry Materials







# NATCO

## WALL CONSTRUCTION

*BULLETIN No. 174*

THIS volume, treating on the various types of NATCO Hollow Tile for exterior and interior walls of all kinds, is a complete text book for the guidance of architects and builders. The methods illustrated and described represent the work as approved by fireproofing engineers and architects, having been determined by wide practical experience in NATCO Hollow Tile construction.

### NATIONAL FIRE PROOFING COMPANY

GENERAL OFFICES  
FULTON BUILDING, PITTSBURGH, PA.

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Land Title Building

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26th and Shields Avenue

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TORONTO, ONTARIO

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## Introduction

**N**ATCO XXX hollow tile with its superior qualities of extra heavy shells and webs, all in direct alignment when laid, and deep dovetail scoring, which affords the best possible mechanical bond for the stucco, costs but little more than other types of tile.

NATCO DOUBLE SHELL TILE, an improved face-tile with double shells for the spreading of horizontal or bed joints of mortar and a moisture stop at each end, not only affords the advantages of end construction (setting the tile with enclosed air-spaces vertical in the walls as embodied in NATCO XXX construction referred to above), but also prevents the spreading of "through" mortar joints, either horizontal or vertical, and thus insulates the wall efficiently against passage of moisture, heat, frost, and sound.

NATCO Header Backer tile, as used for backing up brick

walls in buildings of skeleton construction and in loadbearing walls, is flexible and meets every brick and mortar joint condition. Through its use you save  $\frac{1}{4}$  of the dead load, labor and mortar. Savings in structural steel run into tons and foundation costs are materially reduced.

NATCO SMOOTH TILE is a less expensive face tile for non-bearing or curtain walls of factories, railroad warehouses, farm buildings, etc.

Bulletin 171, on NATCO Standard Fireproofing, describes very completely the use of NATCO Hollow Tile for floors, girder covering, column covering and similar construction. A copy of this bulletin will be sent to you on request.

We shall be glad at all times to give additional or special information regarding our products and their different uses in building construction to any interested party.

## Specifications for Erecting Natco XXX Hollow Tile

**GENERAL:**—Provide and erect all hollow tile exterior and interior bearing walls of hard burned tile, true and regular in size, manufactured of such design that all webs and shells are in direct compression when laid in the wall. Tile shall have all faces scored with special dovetail scoring to offer a good surface for the stucco finish. Tile cracked or broken on the outside shells will not be acceptable under this specification.

All subdividing, non-bearing partitions shall be of hollow partition tile as shown on plans. In general all exterior walls and interior bearing walls shall be of NATCO XXX hollow tile; subdividing walls shall be NATCO partition tile as manufactured by the National Fire Proofing Company.

**LAYING:**—All tile used in the exterior walls and interior bearing partitions must be laid with the holes or voids vertical in the wall, in order to develop their full strength. (See Page 7.) No vertical or head joints shall be mortared through the walls, but a generous air-space shall be left in the center of the walls by buttering the two edges of each tile either before or after it is set in the wall. Interior subdividing, non-bearing partition tile may be laid on side if desired. Care must be taken that the top of all unfinished walls are thoroughly covered or protected against stormy weather.

**MORTAR:**—All mortar used for laying up the hollow tile shall consist of a standard Portland cement and clean sharp sand in the proportion of one part cement to three parts sand, well mixed to a smooth, moderately stiff mortar. Lime not to exceed 10 per cent. of the cement by volume, will be allowed in the mortar.

**FOUNDATION WALLS:**—Where so indicated on plans, the foundation walls from top of footings to the underside of first floor beams shall be constructed of 9-hole 12 x 12 x 12 NATCO XXX hollow tile. Care should be taken to use 6 x 12 x 12 NATCO XXX hollow tile at the corners. (See Page 7.) Outside of walls from footing to a point above the ground shall be given a heavy coat of waterproofed cement or other approved damp-proofing.

Where columns or piers supporting heavy loads rest on the foundation wall, the same shall be filled with concrete from footing to top of wall to prevent the possibility of failure due to compression.

**EXTERIOR WALLS AND BEARING PARTITIONS:**—Exterior walls and bearing partitions shall be of thickness shown on the plans and must be in accordance with the foregoing conditions of quality, etc.

**SUBDIVIDING PARTITIONS:**—Subdividing, non-bearing partitions shall be of hard burned NATCO hollow tile (scored for plastering). All partitions must be started on the structural floor and wedged against the floor above.

**JAMB TILE:**—Provide for all double hung windows, NATCO XXX jamb tile with rabbetted openings to receive the window frame box. Fill well with mortar the space between the tile and the frame box to within one inch of stop bead with roofer's cement or oakum to prevent the passage of air or moisture. (See Page 9.)

**LINTELS:**—Openings not exceeding 5' 0" in clear span may be spanned with NATCO XXX arch lintel tile or with NATCO XXX tile reinforced with rods in lower cells and filled solidly with concrete. (See Page 15.)

Openings over 5' 0" in clear span to be spanned with reinforced concrete girder faced with tile, or with steel angles—size of structural or reinforcing steel variable with load and span.

**SILLS:**—Form all sills of NATCO special hollow sill tile. Special care must be taken to fill all joints so as to prevent moisture working through the same; wood sill of frame to be set in a heavy bed of roofer's cement. (See Page 9.)

**ARCH OPENINGS:**—Build all arch openings shown on plans of two course rowlock hollow brick header arches, carefully laid on substantial centers, or of hollow tile units small enough to get proper camber without top mortar joints being too heavy. (See Page 13.) Arches will spring from the hollow tile and must be well bedded on them.



**PORCH COLUMNS AND PIERS:**—Construct the porch columns and piers of hollow tile to sizes as shown. Where column finish is round, build the same of three-inch circular hollow tile column covering, filling the column with concrete whenever deemed necessary. Square columns shall be built of the proper size NATCO XXX tile. If steel reinforcement is used, care should be taken to band the steel against lateral deflection. (See Page 12.)

**FLOOR BEAM BEARINGS:**—Provide and set tile slabs one inch thick under all floor beams as bearing plates for the same. (See Page 18.) These slabs shall also be used for working up to levels and story heights when the full or fractional tile do not work out correctly.

**BEAM COURSES:**—Wood floor beams are to be framed into exterior walls as shown on detail, using NATCO XXX hollow tile in accordance with the following: in eight-inch walls  $3\frac{3}{4} \times 12 \times 12$  for facing ends of beams, and  $3\frac{3}{4} \times 12 \times 12$  for filling between beams. (See Page 18.) In ten-inch walls  $3\frac{3}{4} \times 12 \times 12$  for facing ends of beams and  $6 \times 12 \times 12$  for filling between beams. In twelve-inch walls  $3\frac{3}{4} \times 12 \times 12$  for facing ends of beams, and  $8 \times 12 \times 12$  tile for filling between beams.

**ROOF PLATES:**—Embed in cement grout in two upper courses of wall at intervals of five feet,  $\frac{3}{4}$ -inch bolts twenty-four inches long. Bolt to project six inches above the top of the wall to allow of plate being fastened down with nuts. (See Pages 18 and 19.)

## *Specifications for Stucco on Hollow Tile*

All joints between door frames, window frames at head, sides and sills, must be tightly calked with oakum or roofer's cement; also the wash or slope of sills, etc., should be given a heavy coat of waterproofing before stucco is applied.

All stucco should be applied immediately upon being mixed and should not be rettempered after it has become partially set. No stucco is to be applied in freezing weather or when it is liable to freeze before it sets. It is advisable to keep all stucco work thoroughly wetted down until cement has set, particularly in hot weather as too rapid drying will cause cracking.

The surface to which scratch coat is applied shall be free from all foreign material and shall be thoroughly wetted down before the first coat is applied. The first coat to be applied with force so as to key behind the dovetail scoring, also to prevent air bubbles or holes, and to be thoroughly scratched to insure proper bond with the next coat. The second coat should be applied as soon as the prior coat has sufficiently set to allow working upon the same, and should be straightened with darby and straight edge, then floated with cork or wooden float to prevent waves showing on the finished wall.

Should it be impossible to apply the second and latter coats as soon as the former coat has become thoroughly set, it is advisable to wet down the coat which has been applied as this gives a better bond between successive layers.

The finish coat should, as far as possible, be applied to the entire area of one side of structure at one operation. No finish coat should be left in an unfinished condition. All work should be covered to corners.

Thickness of each coat should average from one-quarter to one-half of an inch. While two coats of stucco, carefully

applied, having a total thickness of not less than three-quarters of an inch is allowable for rough cast or pebble dash finish, much better results can be obtained when three coats are applied. Three coats should always be applied when a smooth or float finish is desired.

Finish coat of stucco should be waterproofed with an approved brand of Integral Waterproofing Compound or other approved compound as per directions of manufacturers.

## *Materials*

The materials composing the stucco shall consist of:—

1. Portland cement which has been carefully tested and found to meet the requirements of the American Society for Testing Materials.

2. Sand which is free from organic matter or loam and uniformly graded in size from coarse to fine.

3. Hydrated lime—any good brand of prepared hydrated lime or well burned slacked lime putty will be accepted.

## *Proportions*

FIRST COAT:—1 cement  
1/10 lime  
2 sand

SECOND COAT:—1 cement  
1/10 lime  
2½ sand

THIRD COAT:—1 cement  
1/10 lime  
3 sand

## *Comparison of Tile Sizes with Brick*

Allowing for the joints in brick work, the several sizes of NATCO hollow tile are equivalent to the following number of brick, based on the standard size common brick as adopted in February, 1920, which is  $8'' \times 2\frac{1}{4}'' \times 3\frac{3}{4}''$ .

$\frac{3}{8}''$  thick joints are allowed for in connection with brick.

|                                     |           |
|-------------------------------------|-----------|
| 4 x 12 x 12 NATCO tile is equal to  | 7 bricks  |
| 8 x 12 x 12 NATCO tile is equal to  | 14 bricks |
| 12 x 12 x 12 NATCO tile is equal to | 21 bricks |
| 4 x 5 x 12 NATCO tile is equal to   | 3 bricks  |
| 8 x 5 x 12 NATCO tile is equal to   | 6 bricks  |

## *Cement Mortar*

NATCO Hollow Building Tile should be set with cement mortar composed by measure of one part Portland cement to not more than three parts clean sharp sand, to which may be added hydrated lime not exceeding 15% by volume of the cement.

**NOTE**—The percentage of lime added is always figured on the quantity of the cement used, therefore 15 per cent is equal to about one-sixth part by measure of the cement.

The lime specified is not needed to make the mortar stronger, but to make it more plastic and easier to handle. Mortar containing lime will adhere better to the tile, makes a neater job and results in a saving in labor. Too much lime must not be used as it weakens the mortar. A straight lime mortar, however rich the mixture, is not suitable for setting

NATCO Hollow Tile. A sand containing a quantity of loam must not be used for cement plastering or stucco.

Sand containing a little clay may be used if the grains are not coated.

Table gives quantities of mortar materials required to lay up 1,000 pieces of NATCO Hollow Tile (pieces not square feet) of the various sizes given. This table allows about 10 per cent for waste and is based on the mixture that is recommended for NATCO Hollow Tile construction, consisting of one part Portland cement and three parts sand, to which 15 per cent of hydrated lime or lime putty is added.

For the convenience of builders the table gives the quantities of lime both by measure and weight for lump lime and by weight for hydrated lime.



# NATIONAL FIRE PROOFING COMPANY

## Table of Quantities for Cement Mortar

MATERIALS REQUIRED TO LAY UP 1,000 PIECES OF NATCO HOLLOW TILE

Barrel of Cement Specified to be 3.8 cu. ft.

| Size of Tile         | Thickness of Wall | Approximate Quantity of Mortar, Cu. Ft. | Mortar Materials Required |               |                             |                              | 15% These Quantities For Ordering Lump Lime in Lbs. |
|----------------------|-------------------|---|---------------------------|---------------|-----------------------------|------------------------------|---|
|                      |                   |   | Cement Sacks              | Sand, Cu. Ft. | 15% Dry Hydrated Lime, Lbs. | 15% Lump Lime Paste, Cu. Ft. |   |
| 4x5x12               | 4"                | 19.66                                   | 6.28                      | 19.65         | 38                          | .94                          | 28  |
| 5x4x12               | 5"                | 23.12                                   | 7.36                      | 23.11         | 44                          | 1.10                         | 33  |
| 5x8x12               | 5"                | 28.91                                   | 9.24                      | 28.89         | 55                          | 1.38                         | 42  |
| 8x5x12               | 8"                | 39.33                                   | 12.56                     | 39.31         | 75                          | 1.88                         | 56  |
| 4x5x12 }<br>8x5x12 } | 12"               | 59.02                                   | 18.88                     | 59.02         | 113                         | 2.83                         | 85  |
| 4x12x12              | 4"                | 27.75                                   | 8.92                      | 27.72         | 54                          | 1.34                         | 40  |
| 6x12x12              | 6"                | 41.66                                   | 13.32                     | 41.66         | 80                          | 1.99                         | 60  |
| 8x12x12              | 8"                | 55.54                                   | 17.76                     | 55.53         | 107                         | 2.66                         | 80  |
| 12x12x12             | 12"               | 83.33                                   | 26.64                     | 83.32         | 160                         | 3.99                         | 120   |
|                      |                   |   |                           |               | "A"                         | "B"                          | "C"   |

Use either one of Columns "A" and "B."

Column "A" is for dry hydrated lime purchased in bags.

Column "B" is for lump lime purchased by barrel or ton.

Column "C" gives the approximate quantity of lump required to make the amount of lime paste given in Column "B."

A barrel of lump lime containing approximately 3 cubic feet, weighing 185 pounds net will produce about 6. to 6.5 cubic feet lime paste which, on account of water added will

weigh about 70 pounds per cubic foot.

NOTE—In giving size of tile, the first number always indicates the thickness of wall, the second the width of tile and the third, the length to which it is cut.

A cubic foot of hydrated lime weighs 40 lbs.

A cubic foot of cement weighs 100 lbs.

Therefore, at 15% there will be 6 lbs. of hydrated lime to add to each cubic foot of cement.

## "Dont's" Which Merit Your Consideration

Don't have your hollow tile dumped from a truck, but have each size of the tile stacked by itself. This will save time and money when your masons are ready for tile, besides doing away with breakage.

Don't patch up your job with brick. NATCO Hollow Tile are made in proper shapes and sizes; it is therefore very seldom necessary to use brick.

Don't use too much lime in your mortar. It weakens the mortar and spoils your reputation.

Don't fail to cover up the top course of tile in wall at quitting time. This protects your work and prevents the filling of cells with rain or snow.

Don't leave any holes or crevices on the outside or inside of the wall. Be sure all joints are well sealed. Above all, do not depend upon the stucco to fill up the mortar joints.

Don't allow your mason to break up a lot of tile when they require small pieces, as we ship a percentage of fractional tile in each order.

Don't use the nest of 1-inch slabs as full tile. They should be broken apart and single slabs used for bearing under joists, for working up to the story heights, sills, etc.

Don't cut holes into the tile in which to frame your joists, but use the facing tile at ends of beams, and other tile be-

tween beams. Remember that the strength of your wall depends upon thorough bearing of webs and shells, and every hole weakens the wall, and is the easiest way for dampness to penetrate.

Don't forget to put proper drips on the underside of the sills. This is very important.

Don't use special arch lintels for spans wider than 5 feet. These should be made of stock tile reinforced or concrete girders faced with tile.

Don't forget that all wooden frame work will shrink; therefore, special care should be taken to thoroughly calk between all wood work and hollow tile.

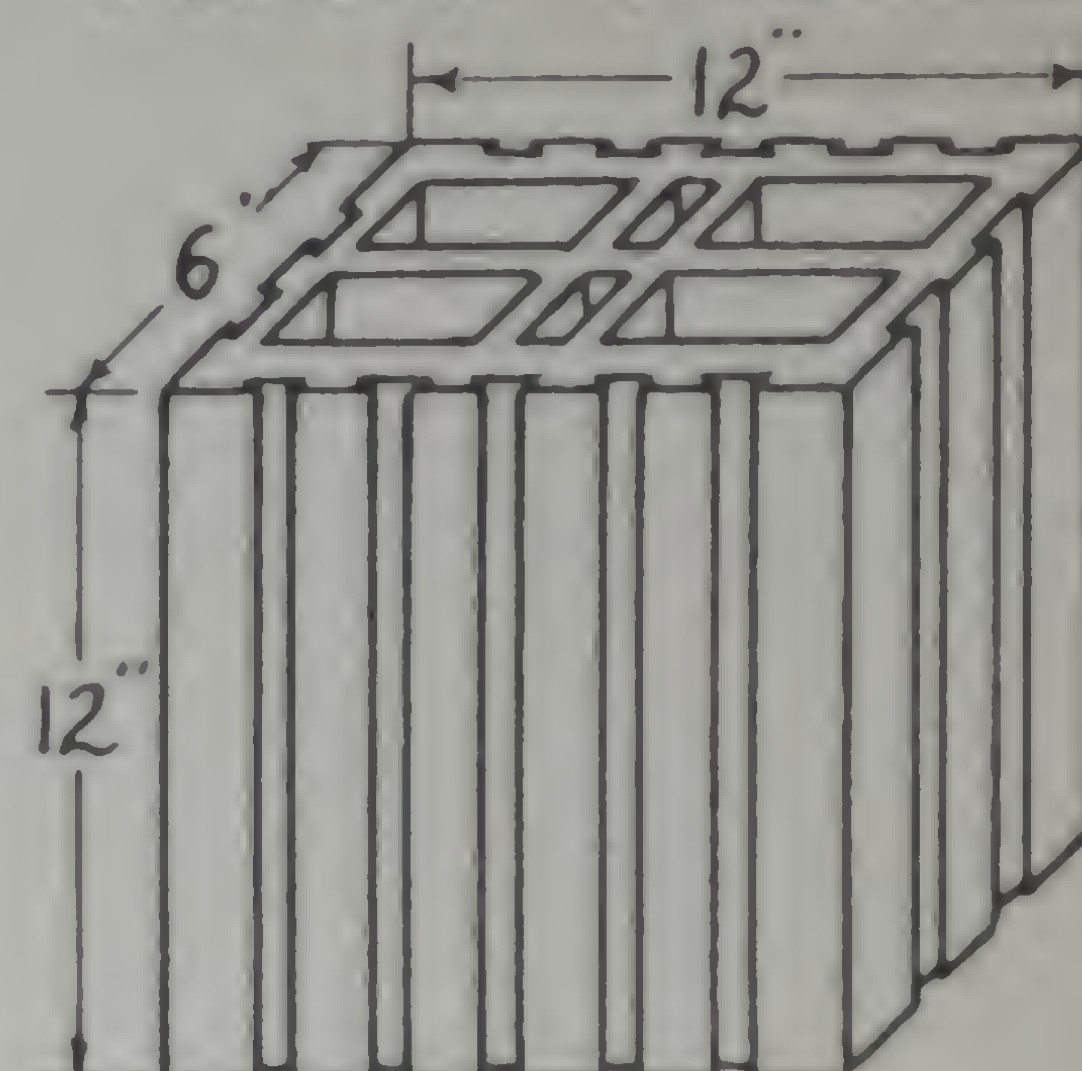
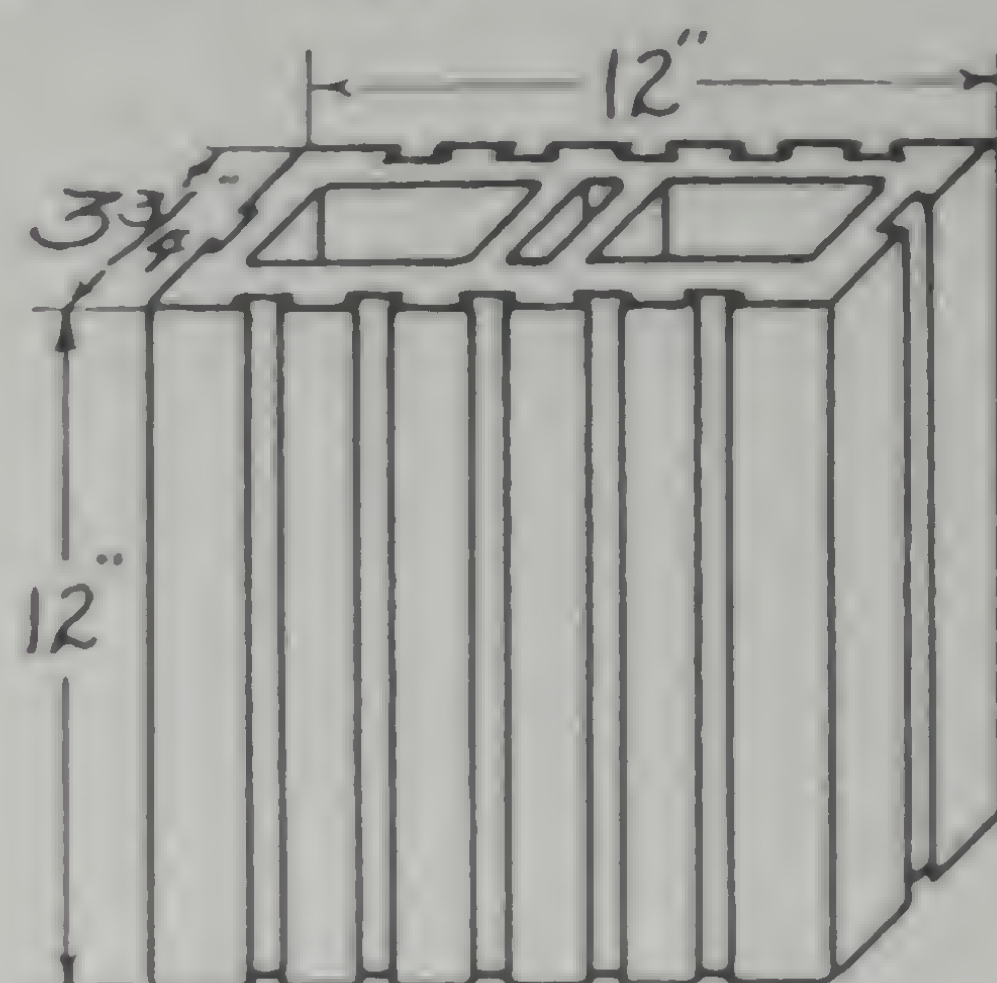
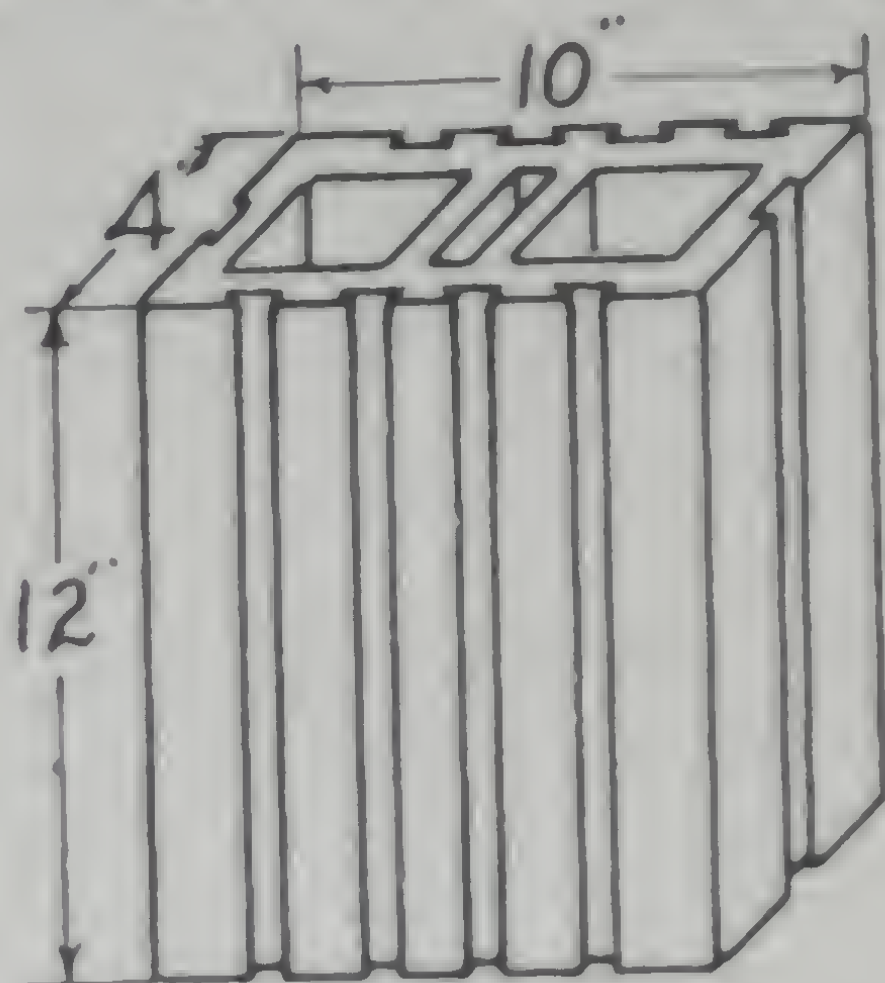
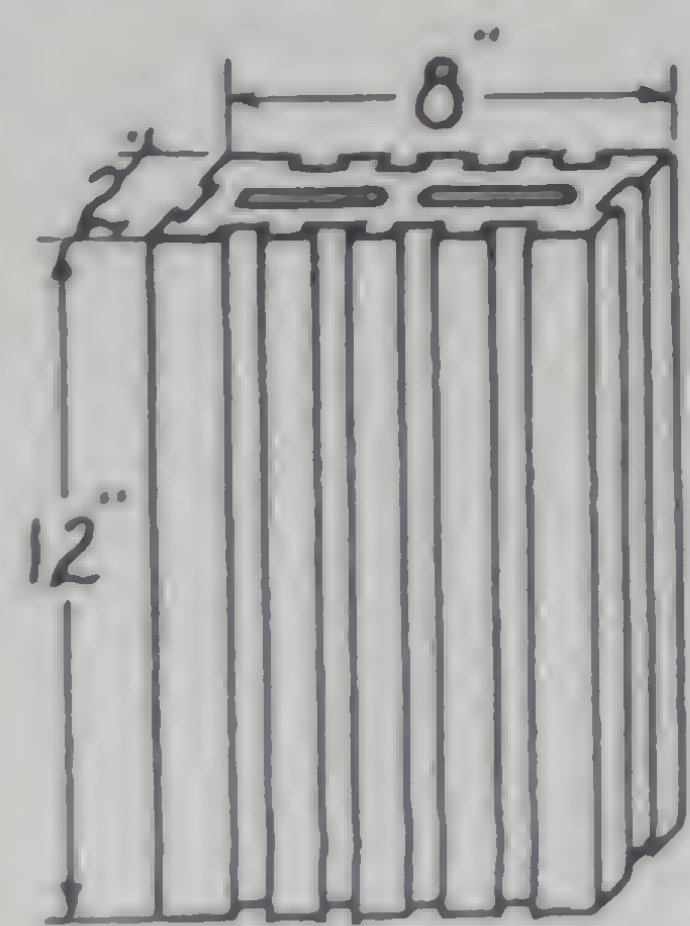
Don't forget to use a good waterproofing compound in the finish coat of your stucco, if the house is situated in a position exposed to driving storms.

Don't try to apply stucco during freezing weather.

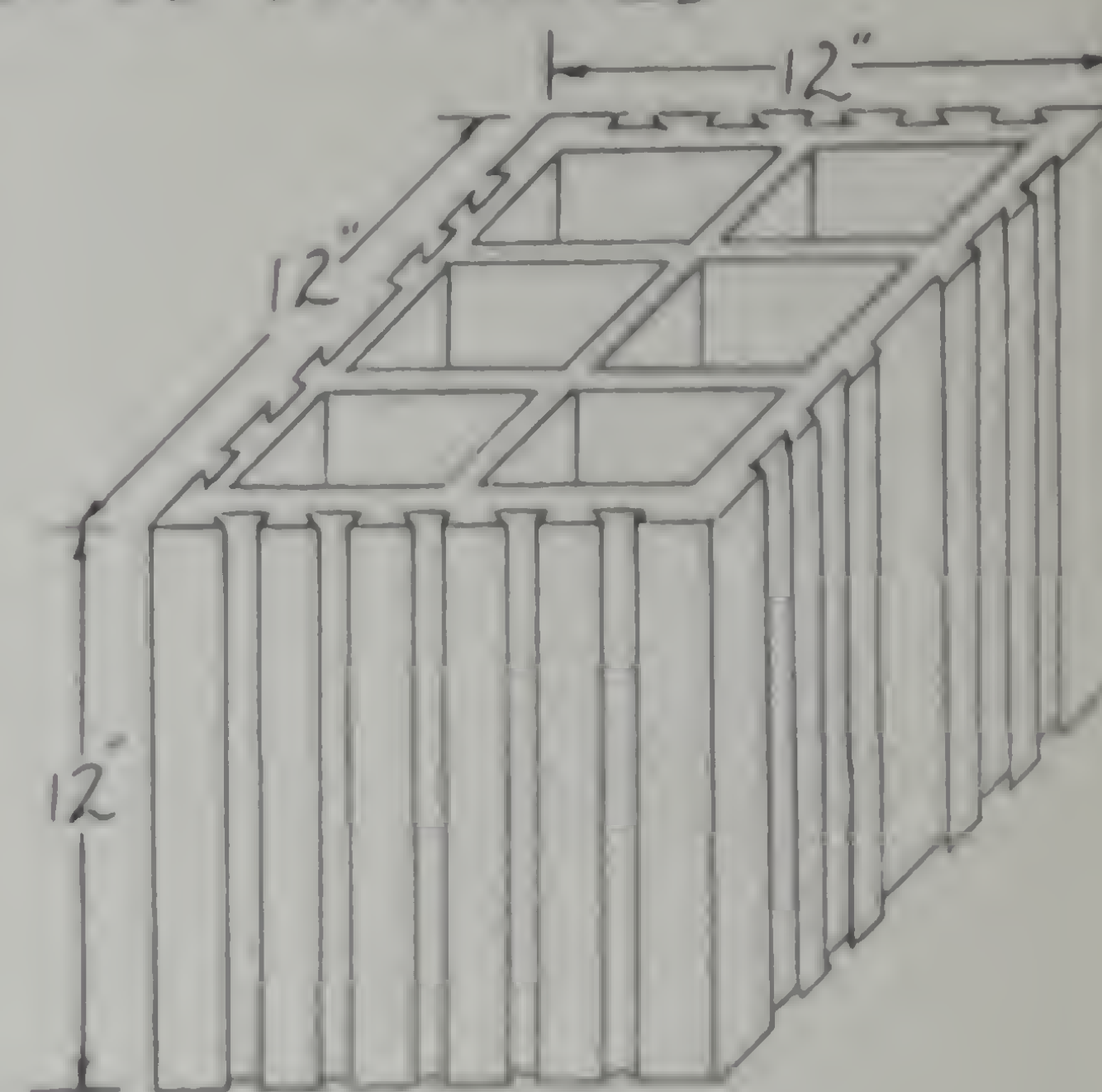
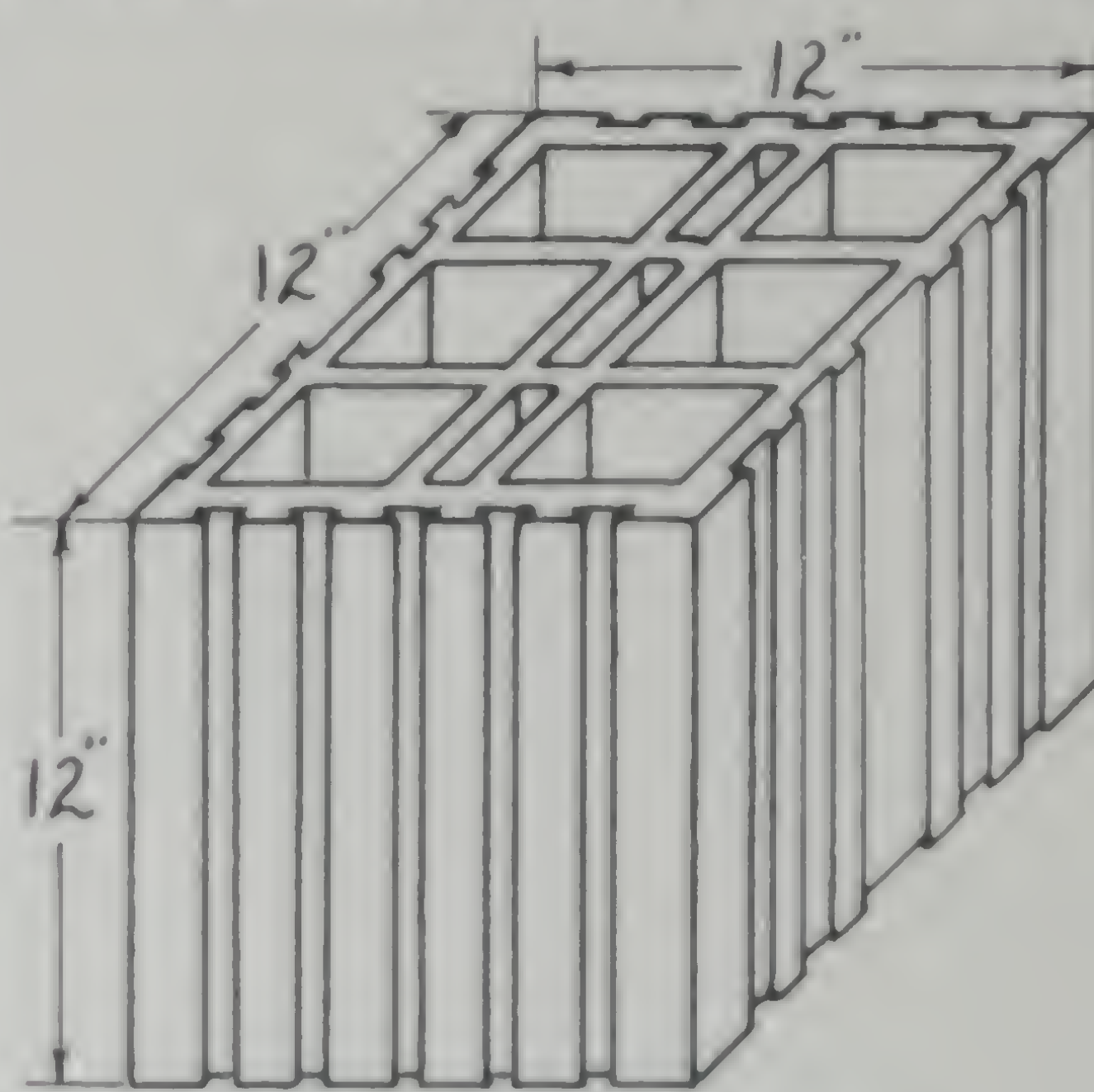
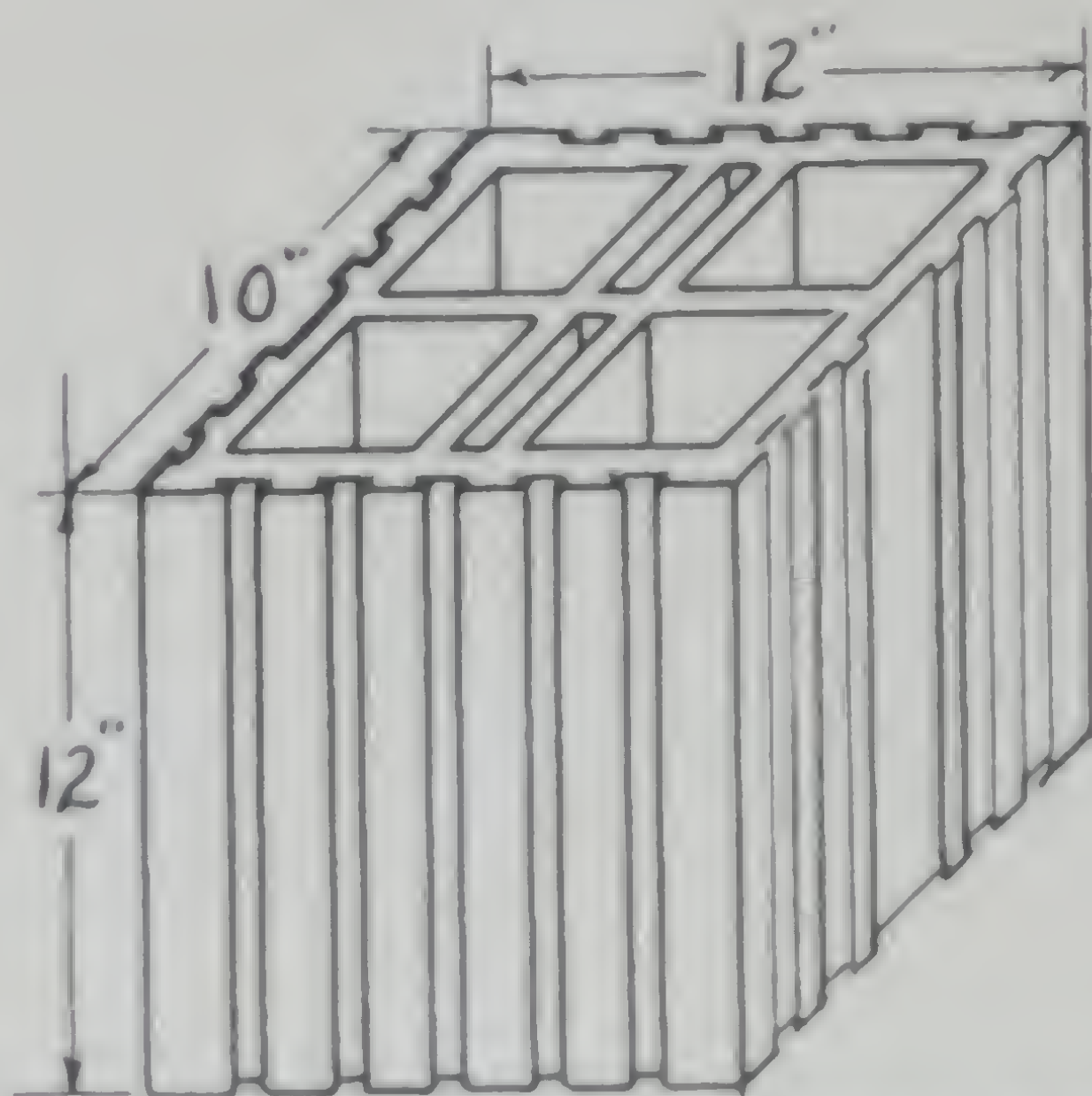
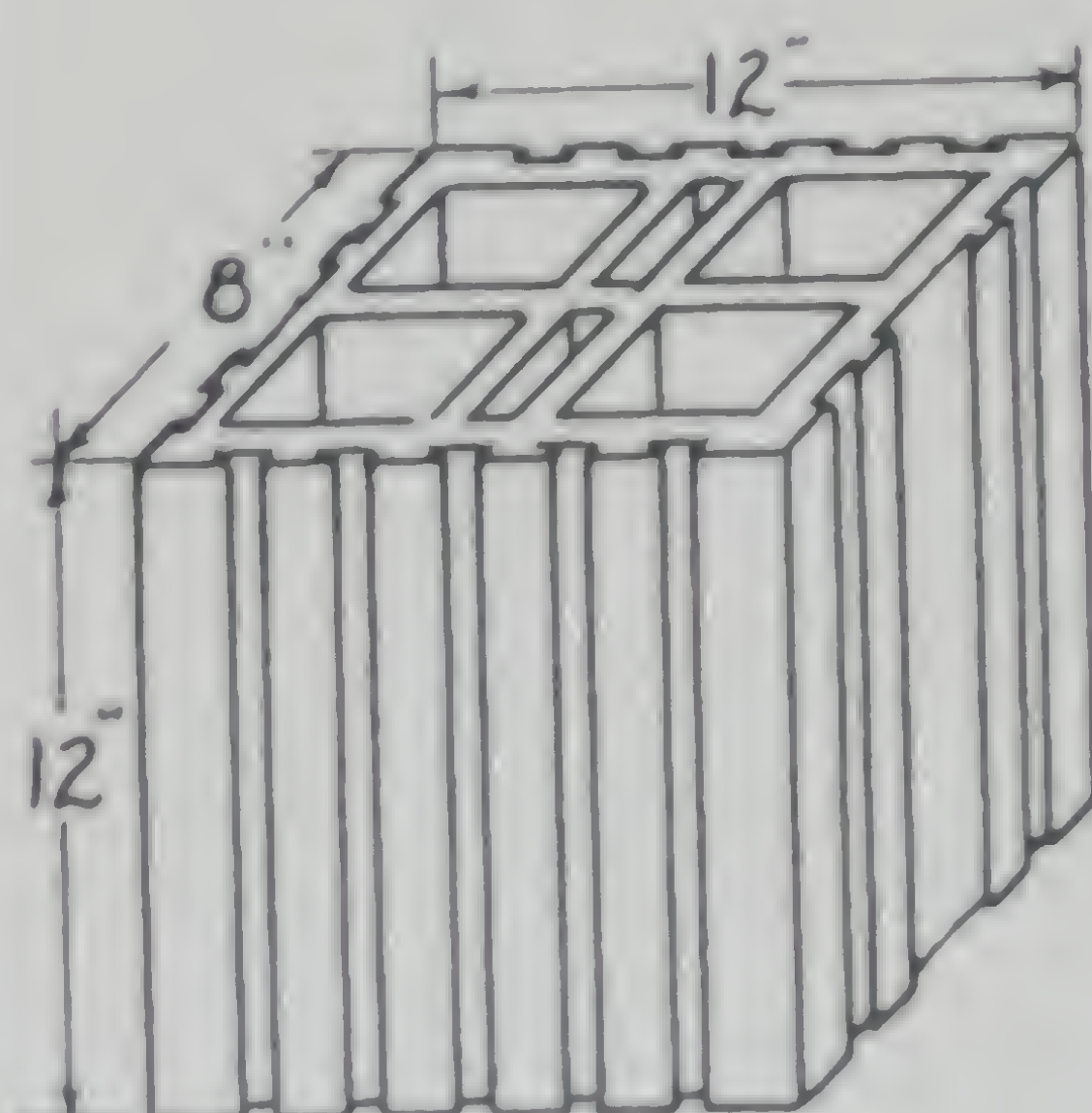
Don't guess where the various sizes of tile are to be used, as we will gladly make notations of different sizes, etc., on plans, if you will send them to us, or we will send our representative to see you. Remember that we are glad to give you any information for we are just as anxious as you are to have the work satisfactory.



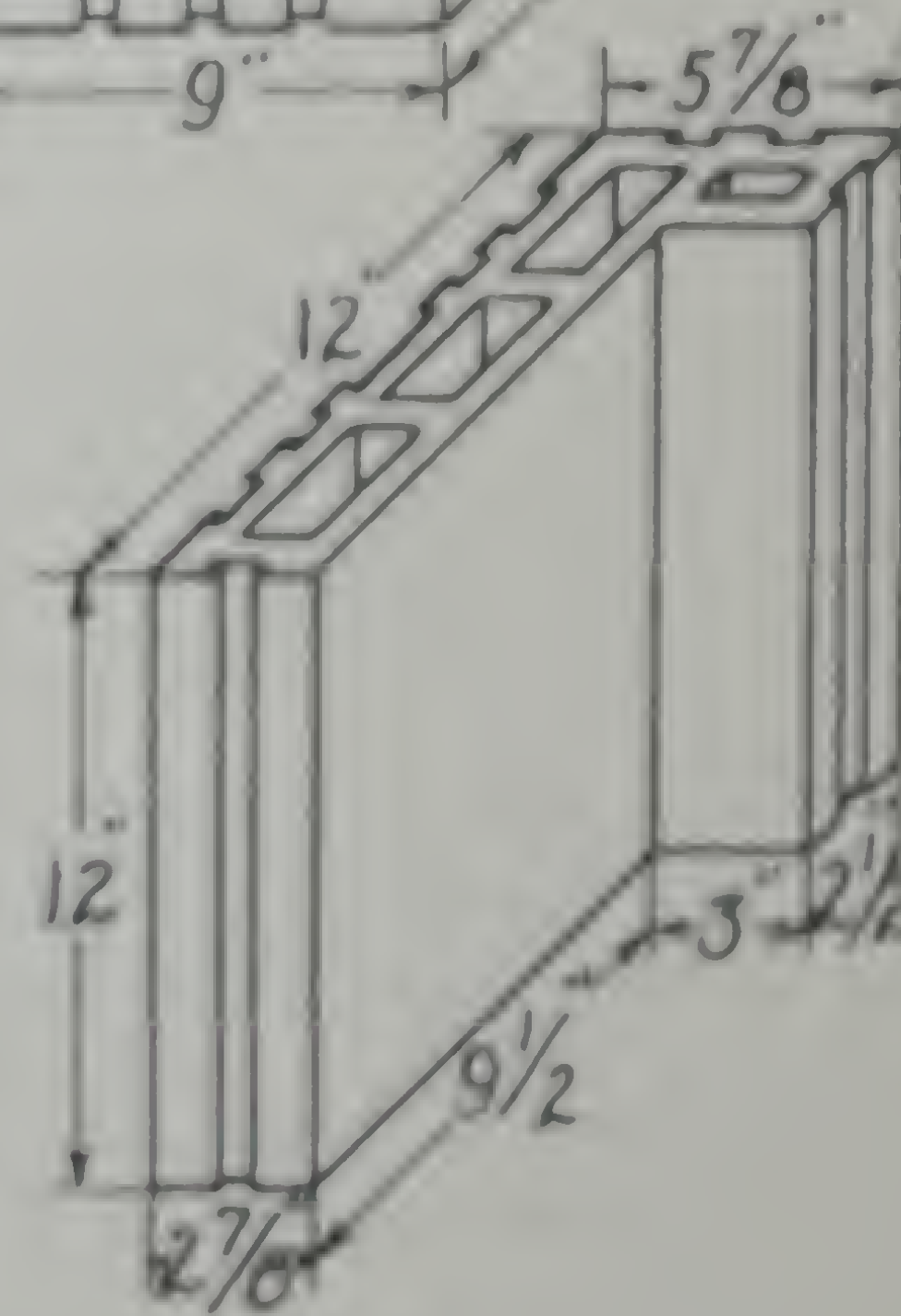
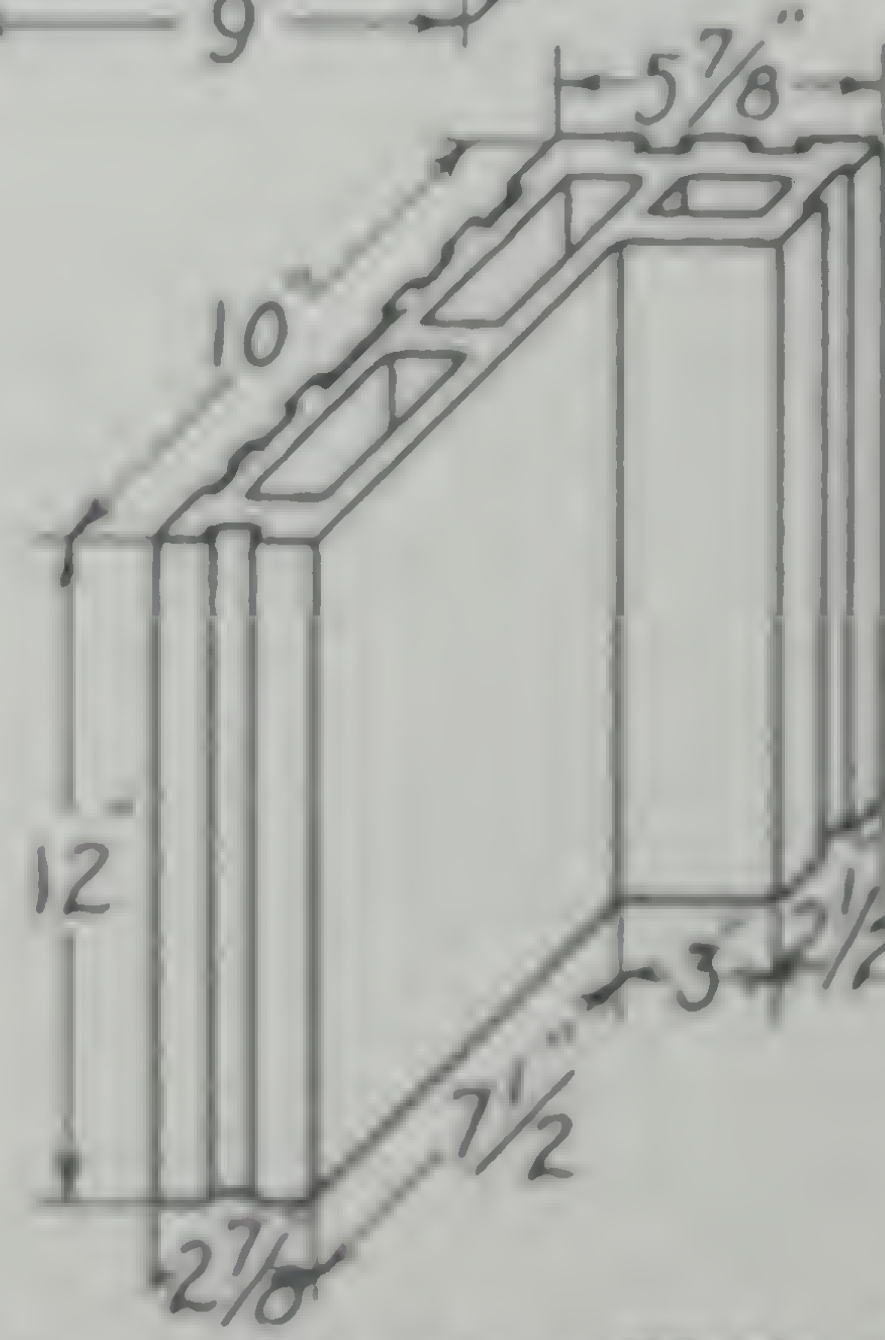
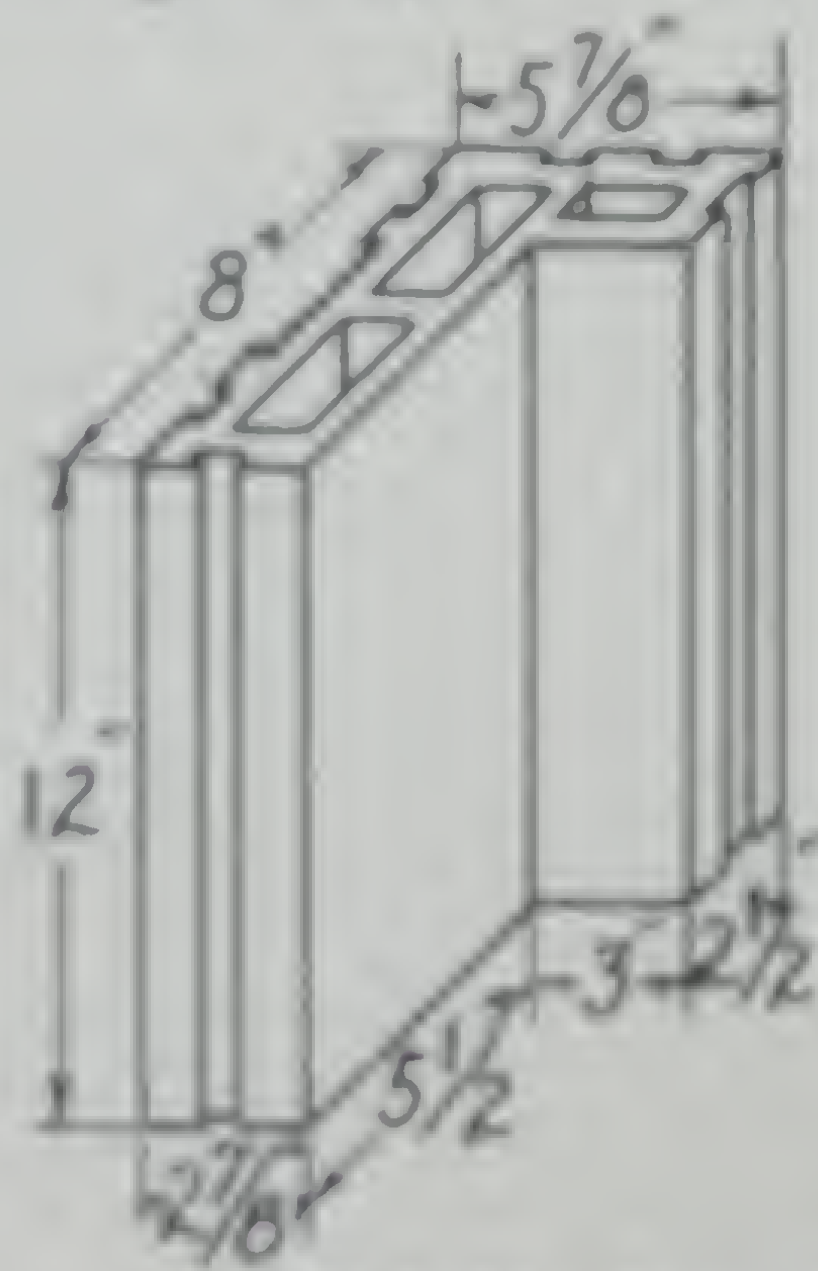
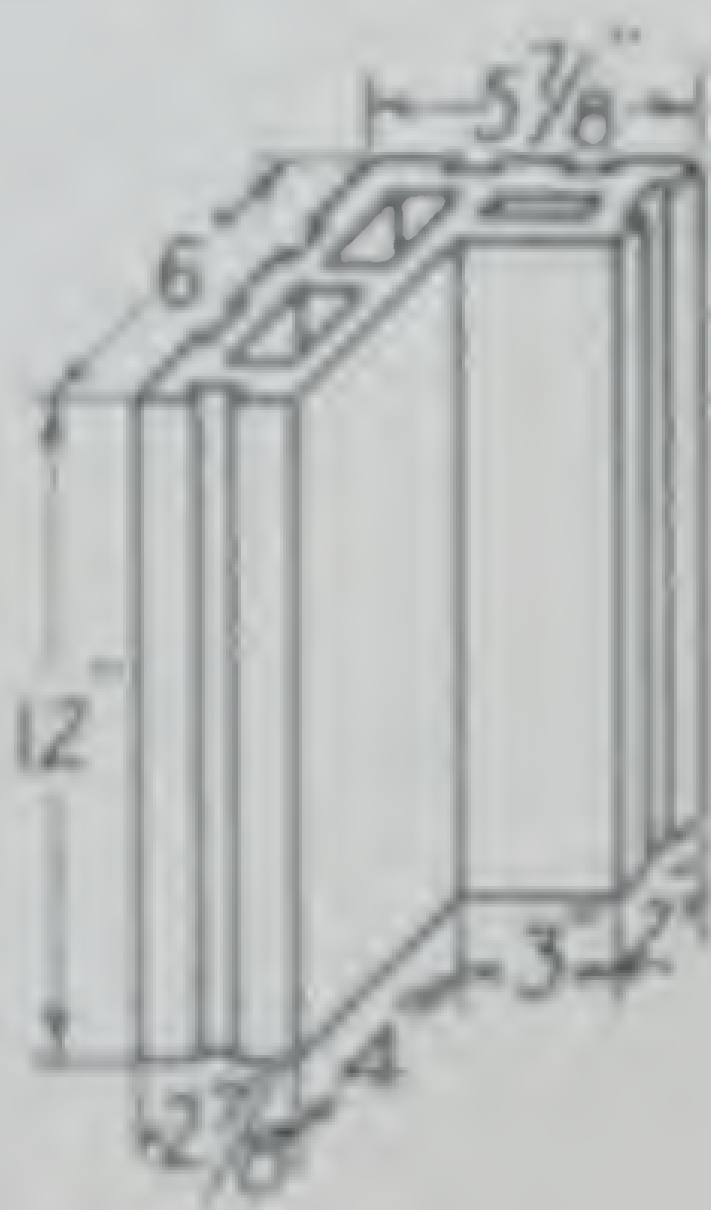
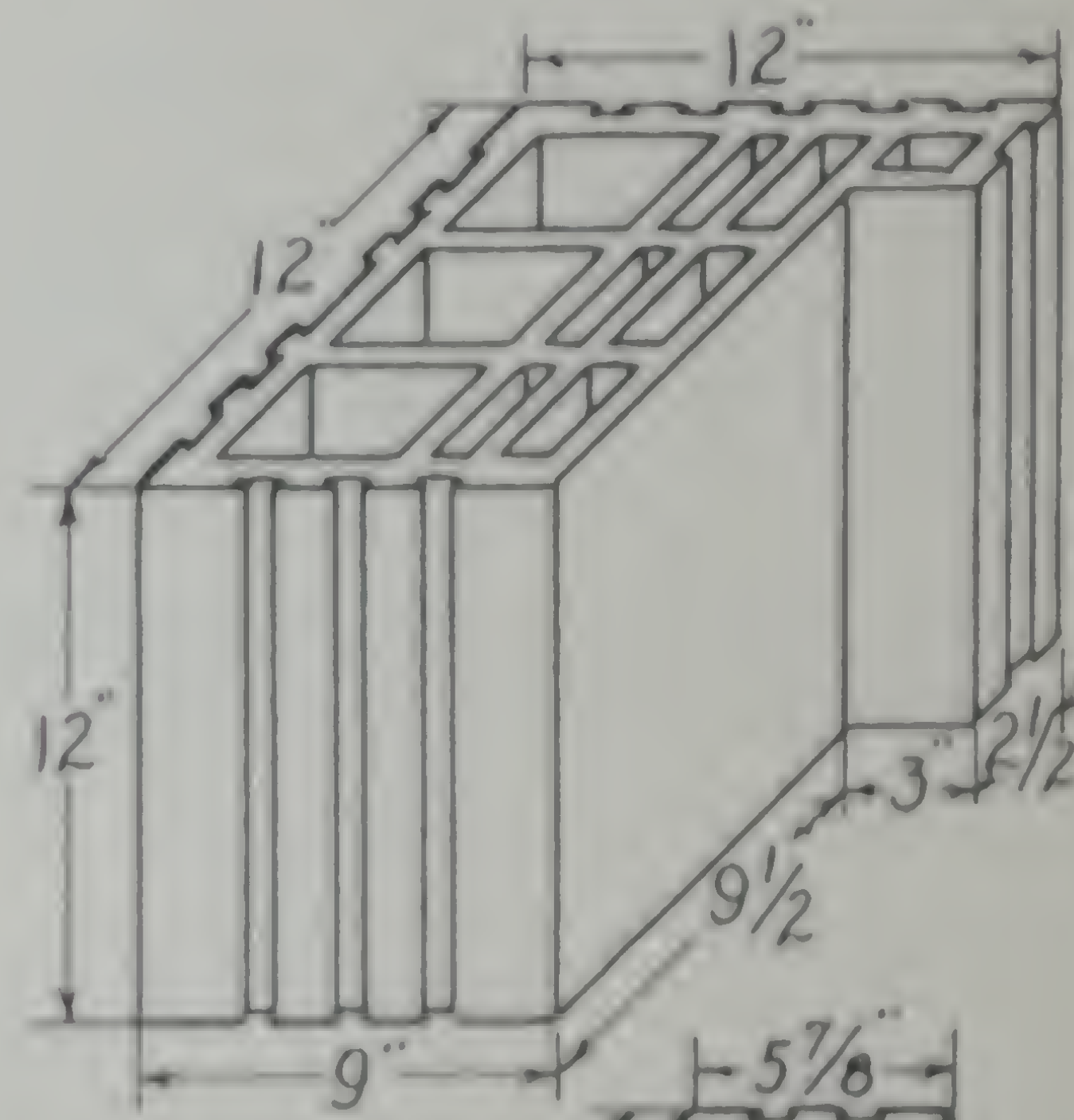
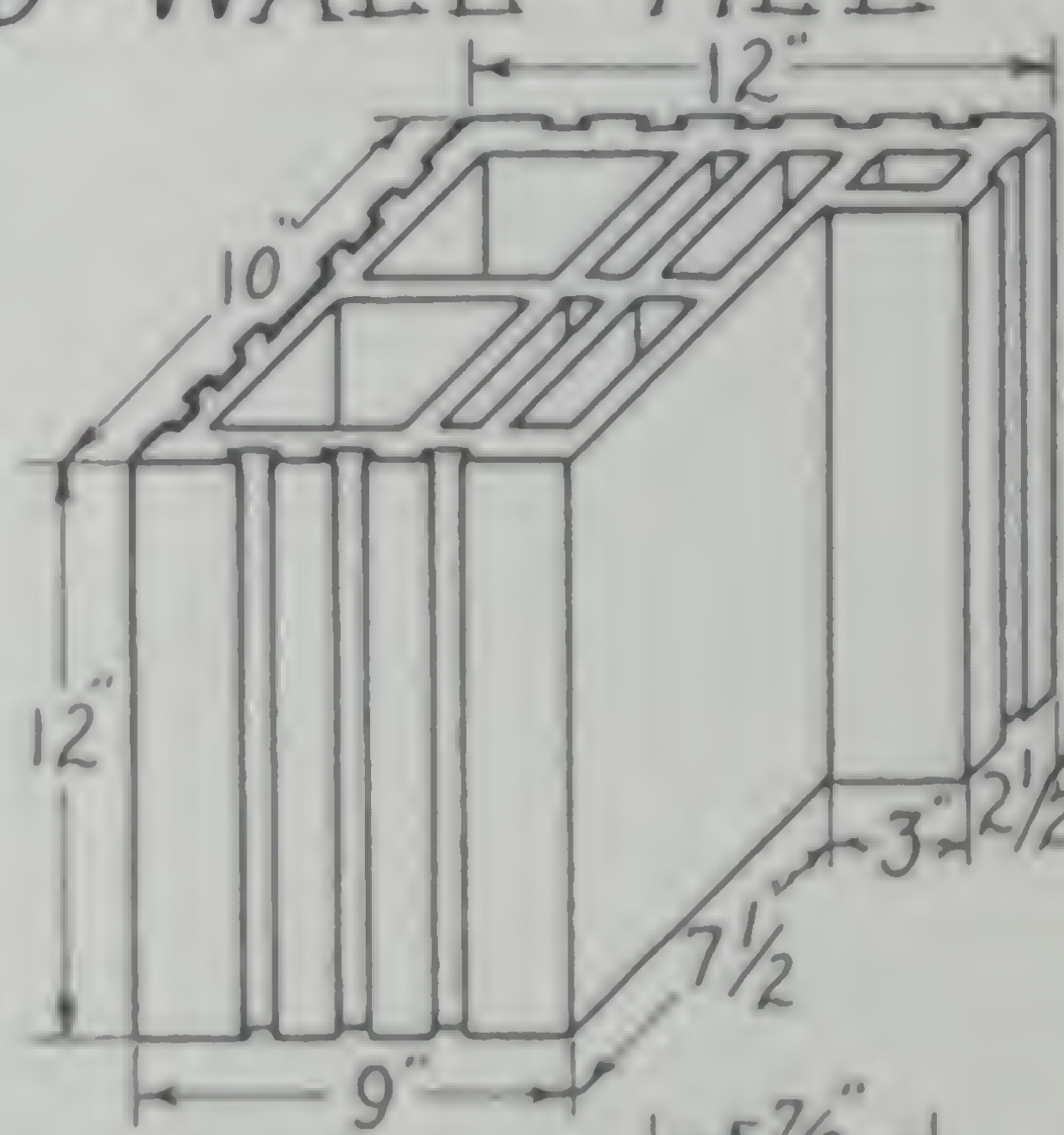
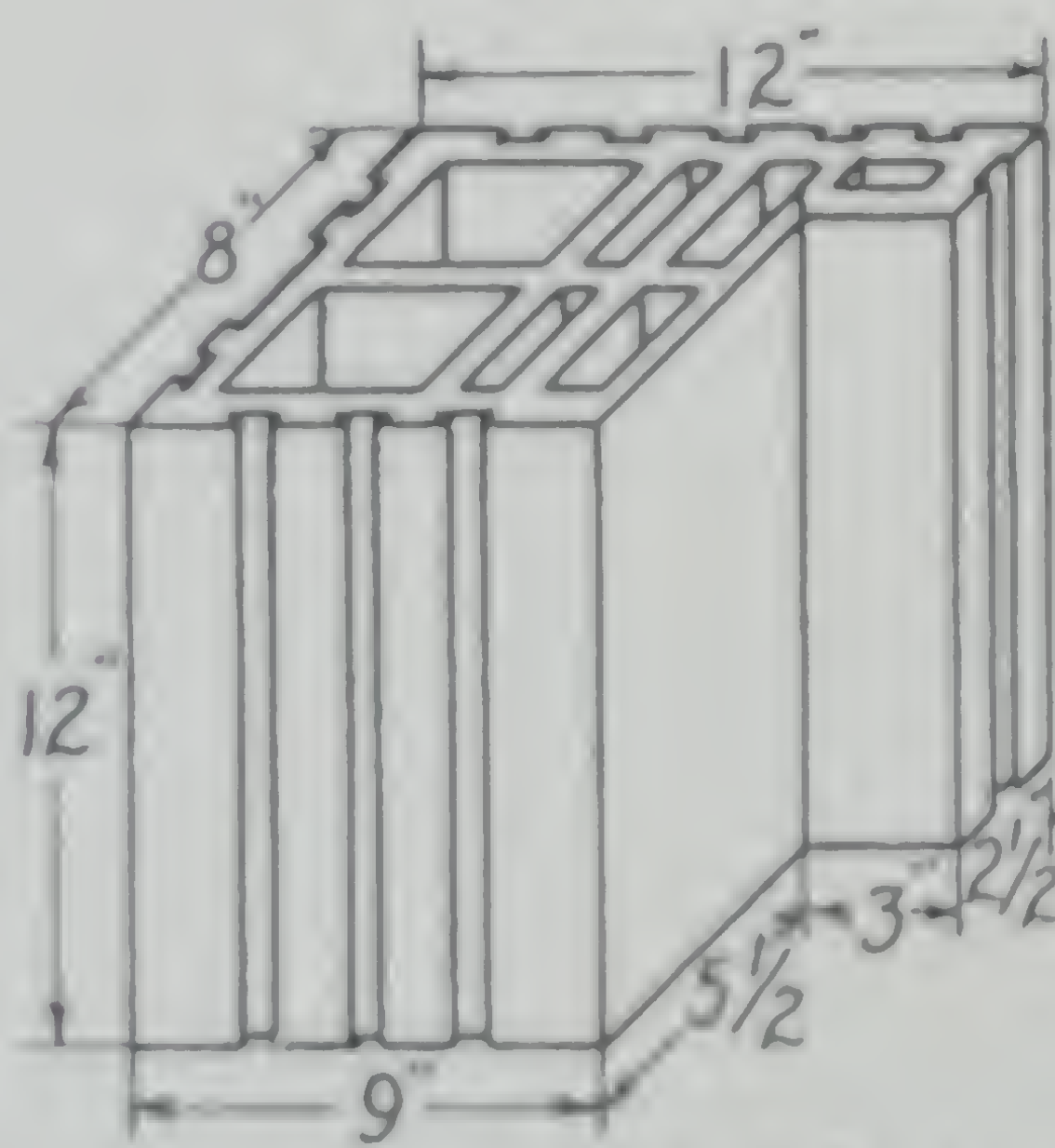
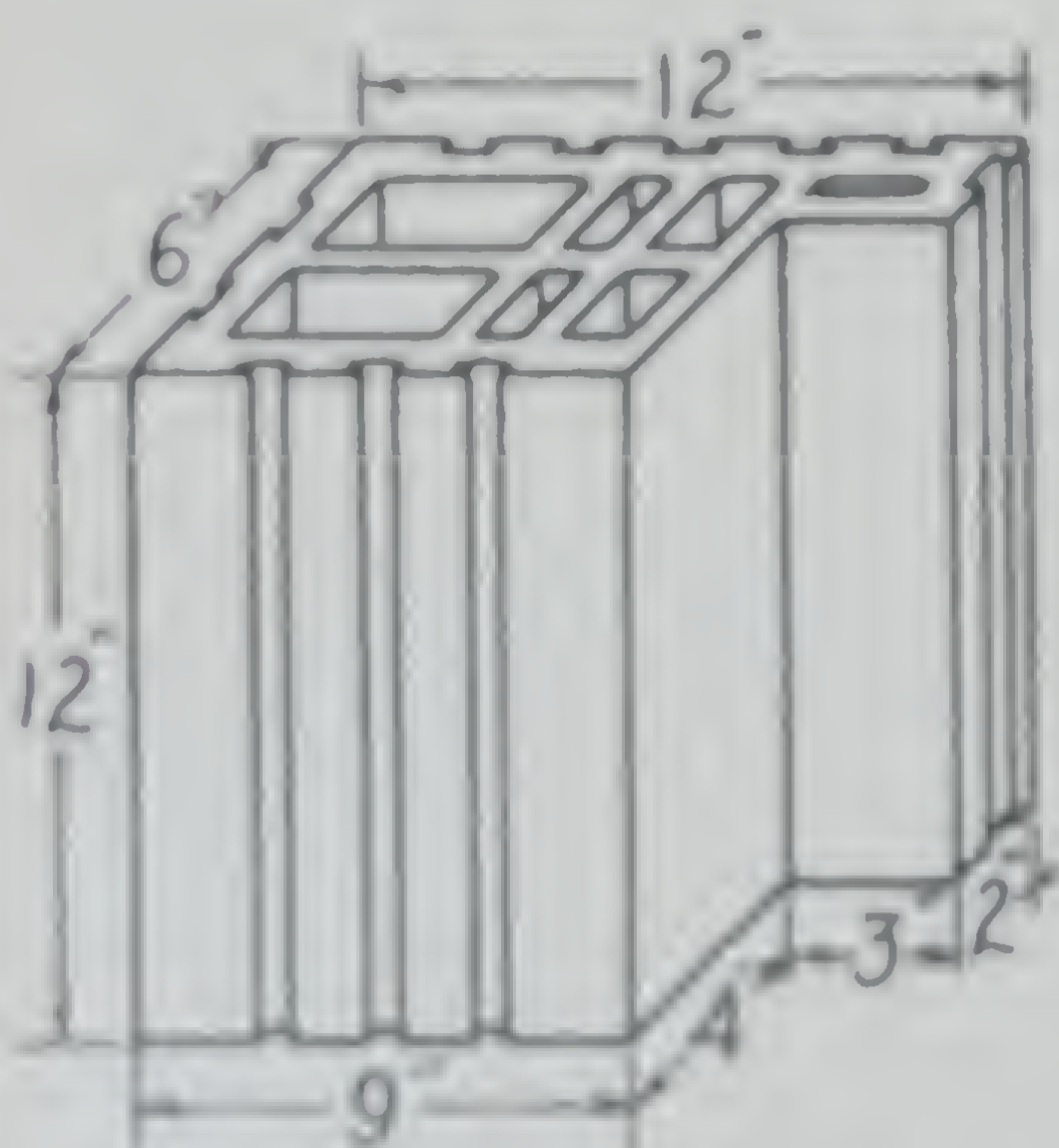
• DETAILS • OF • SHAPES • & • SIZES • OF • NATCO • XXX • TILE •



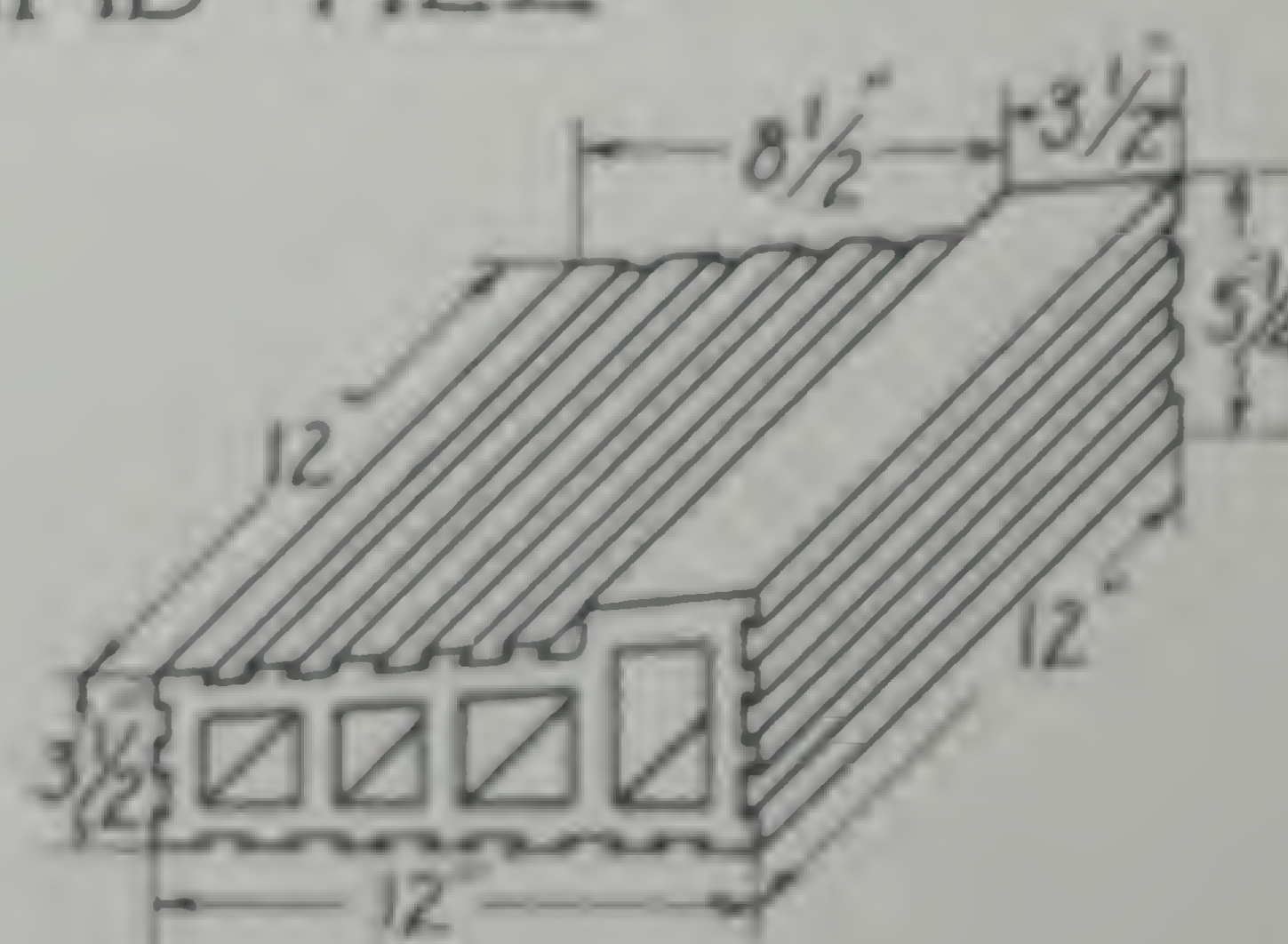
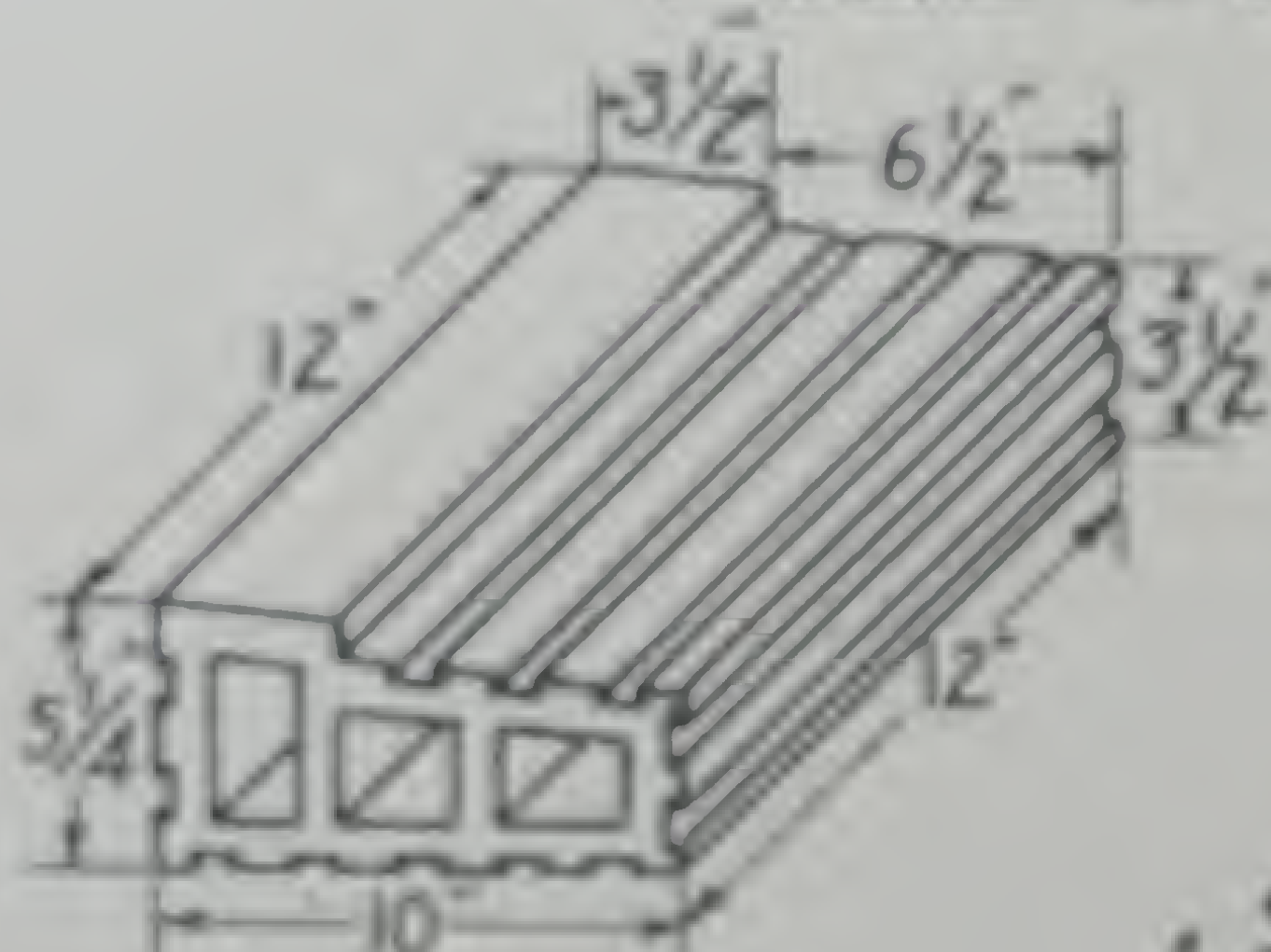
A REASONABLE PERCENTAGE OF HALVES (TILE 6 INCHES IN HEIGHT) CAN ALWAYS BE FURNISHED



• STANDARD • WALL • TILE •



• FULL • & • HALF • JAMB • TILE •



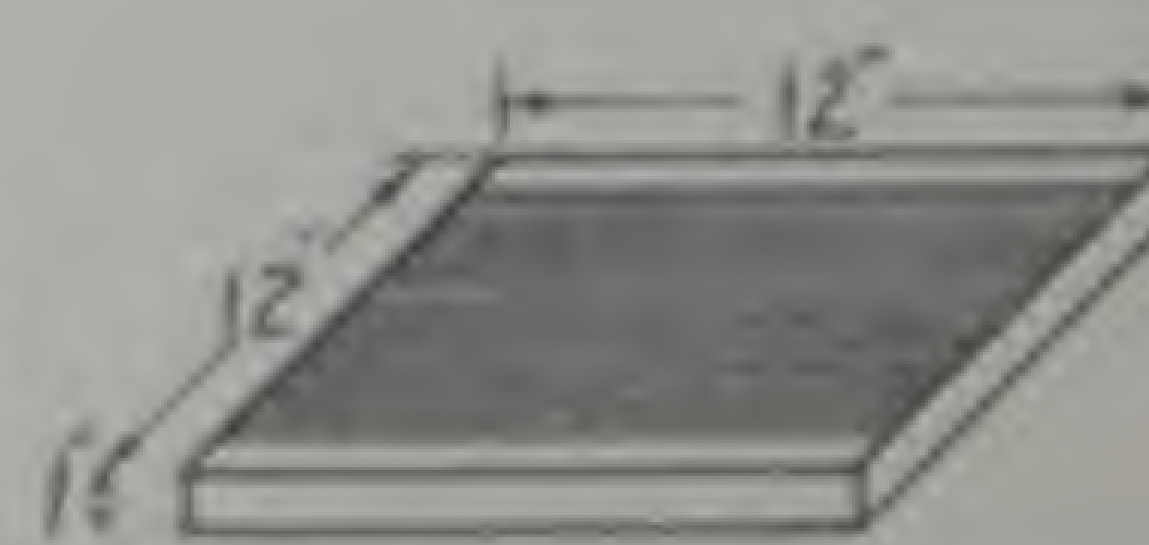
• SILLS •



SOLID

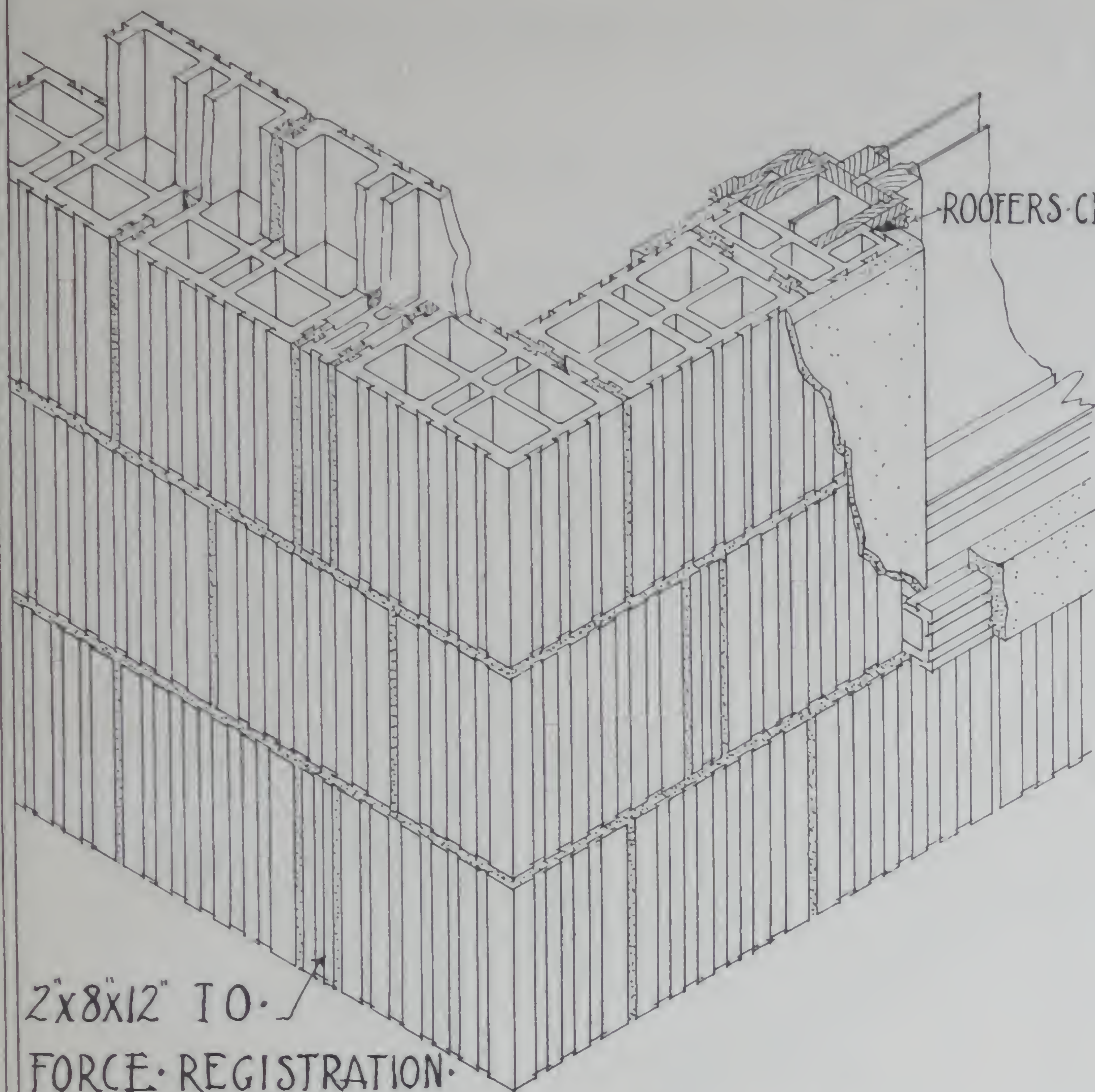


SLABS



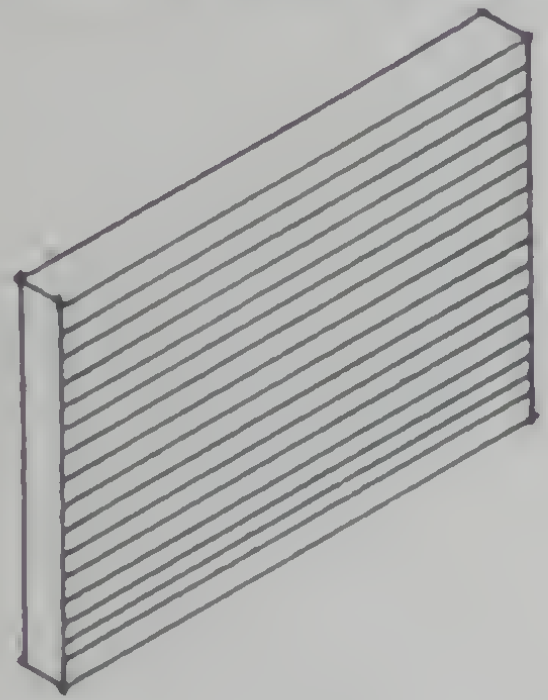


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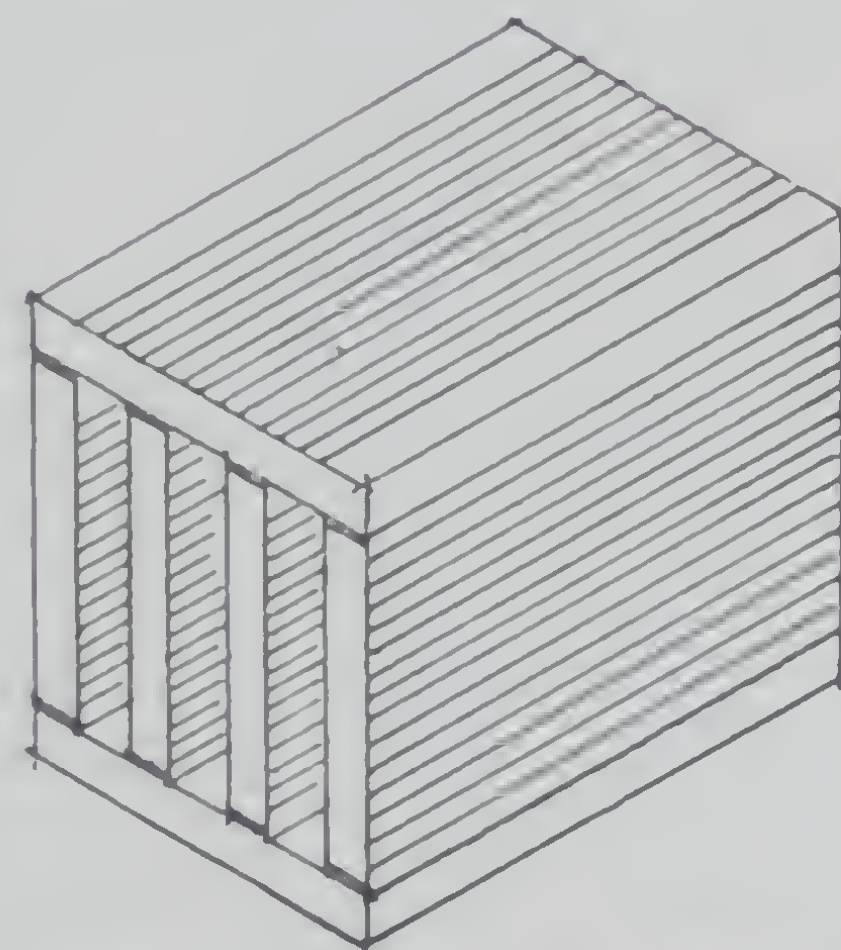


2x8x12 TO  
FORCE REGISTRATION

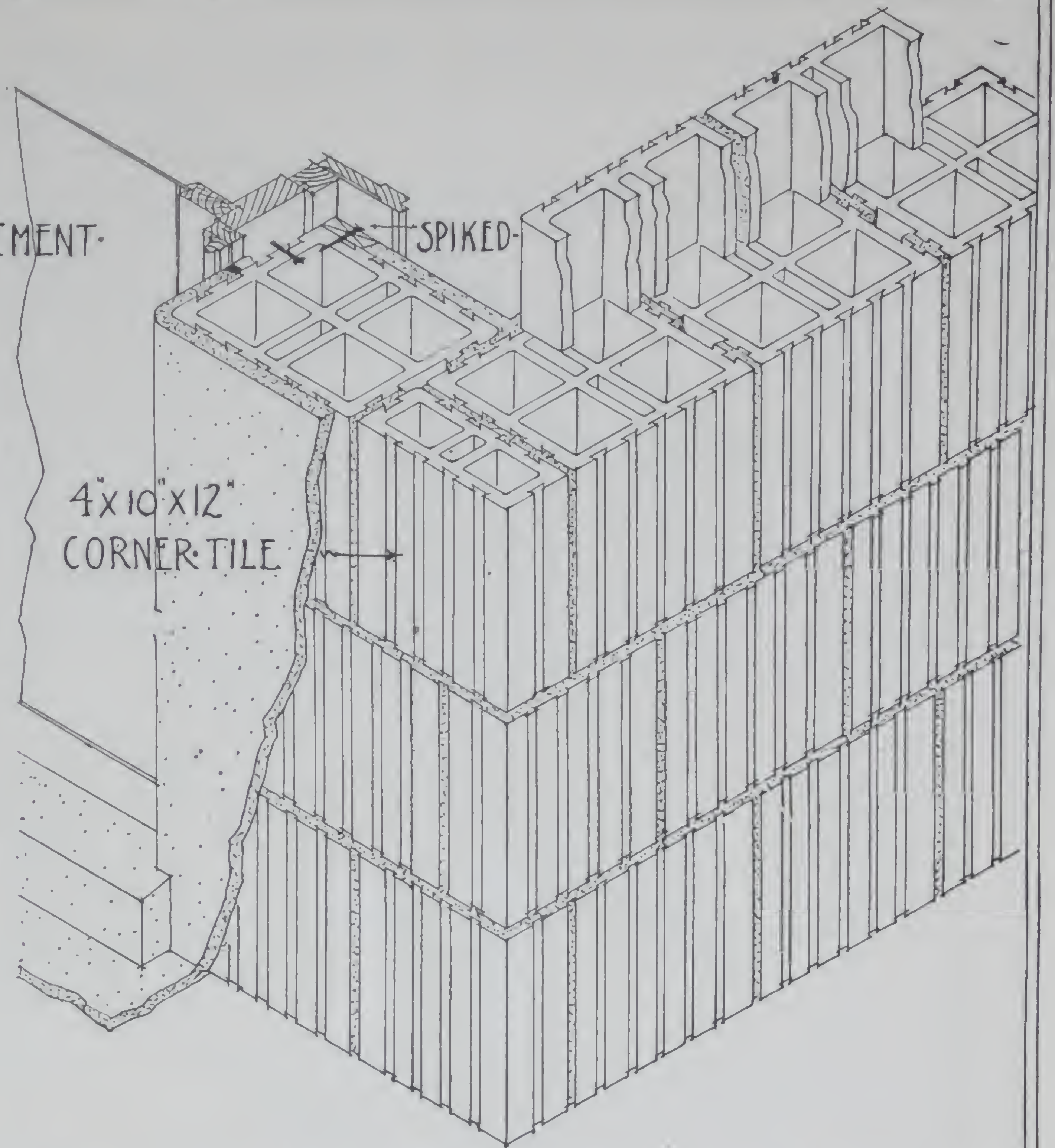
ISOMETRIC VIEW OF 8 INCH TILE WALL



ISOMETRIC VIEW OF NEST AS  
MANUFACTURED



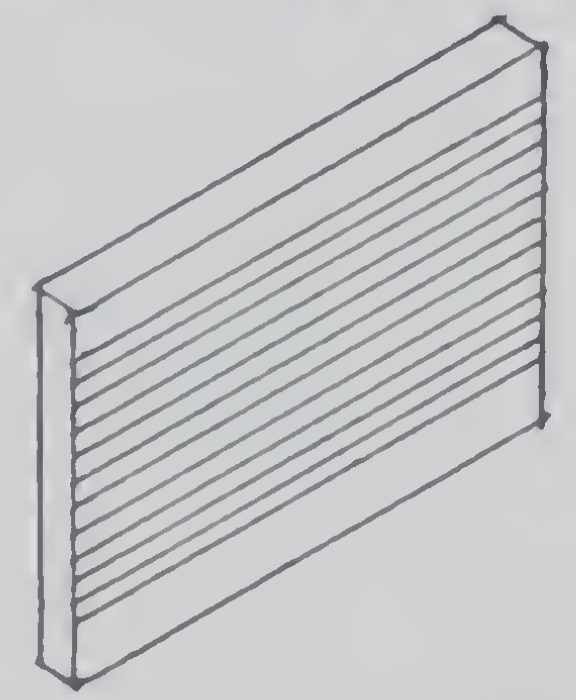
NEST OF 1 INCH SLABS



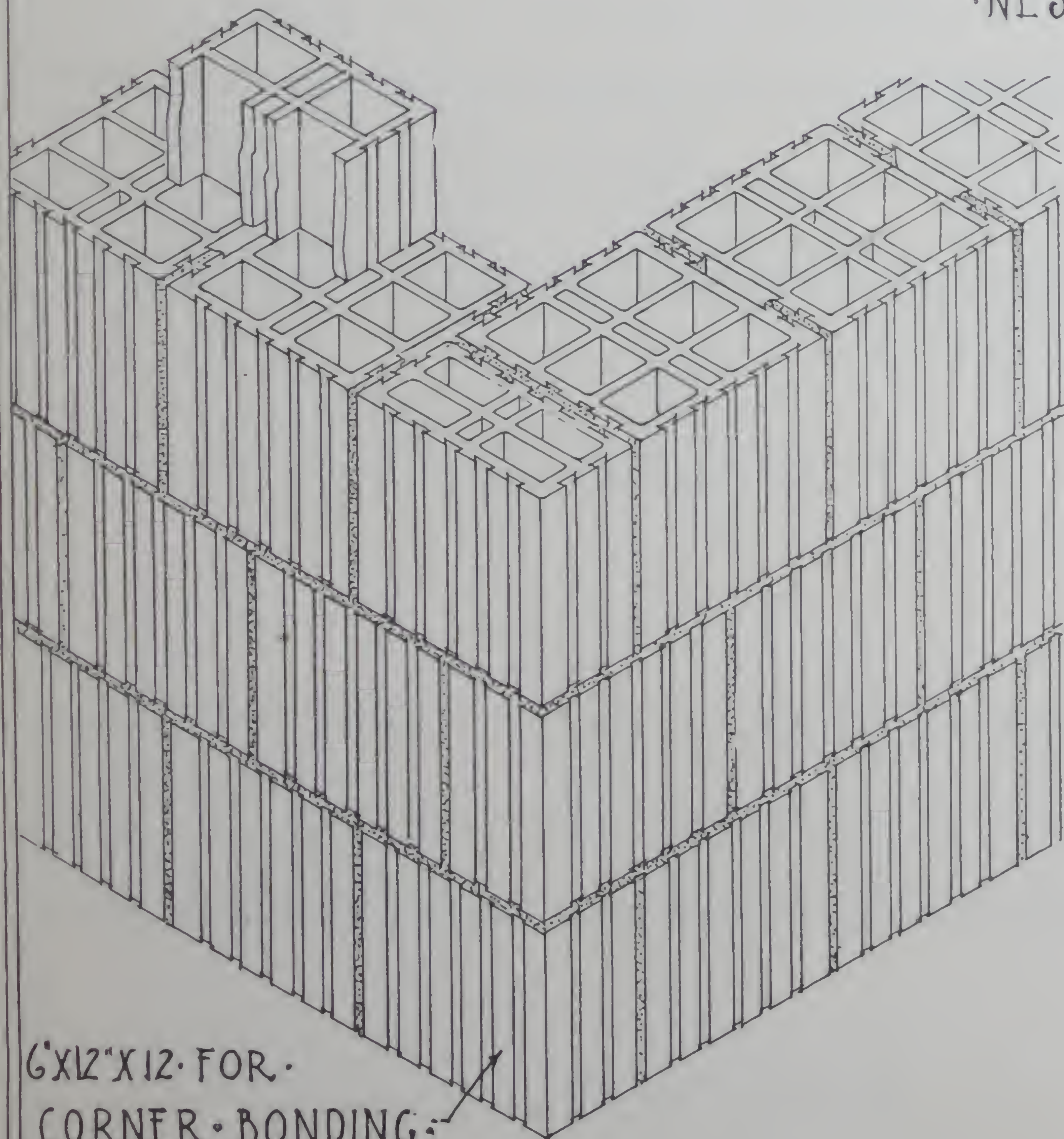
4x10x12  
CORNER TILE

ISOMETRIC VIEW OF 10" TILE WALL

TAP ON CORNERS TO  
SEPARATE SLABS

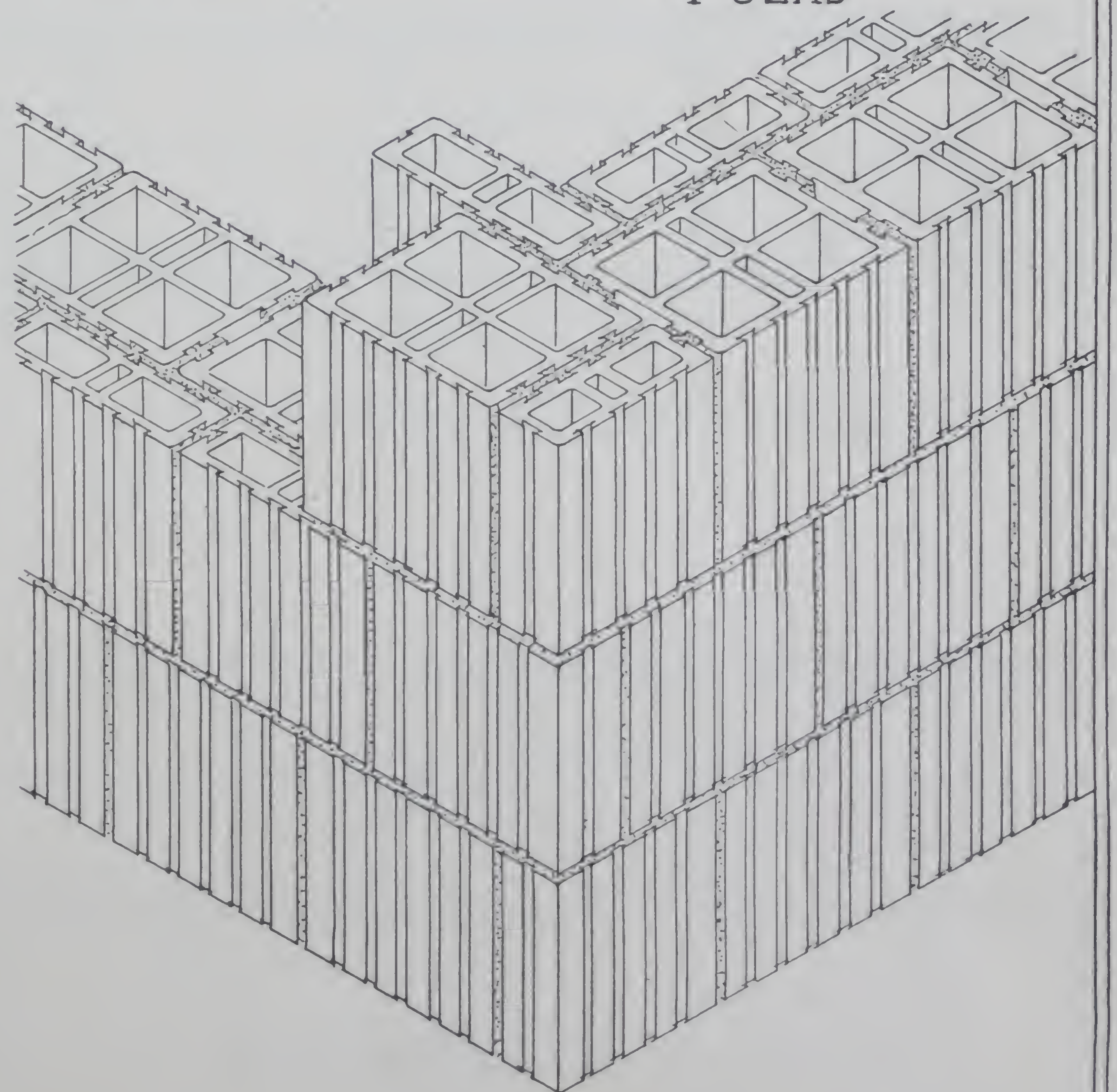


ISOMETRIC VIEW OF SINGLE  
1" SLAB



6x12x12 FOR  
CORNER BONDING

ISOMETRIC VIEW OF 12" TILE WALL

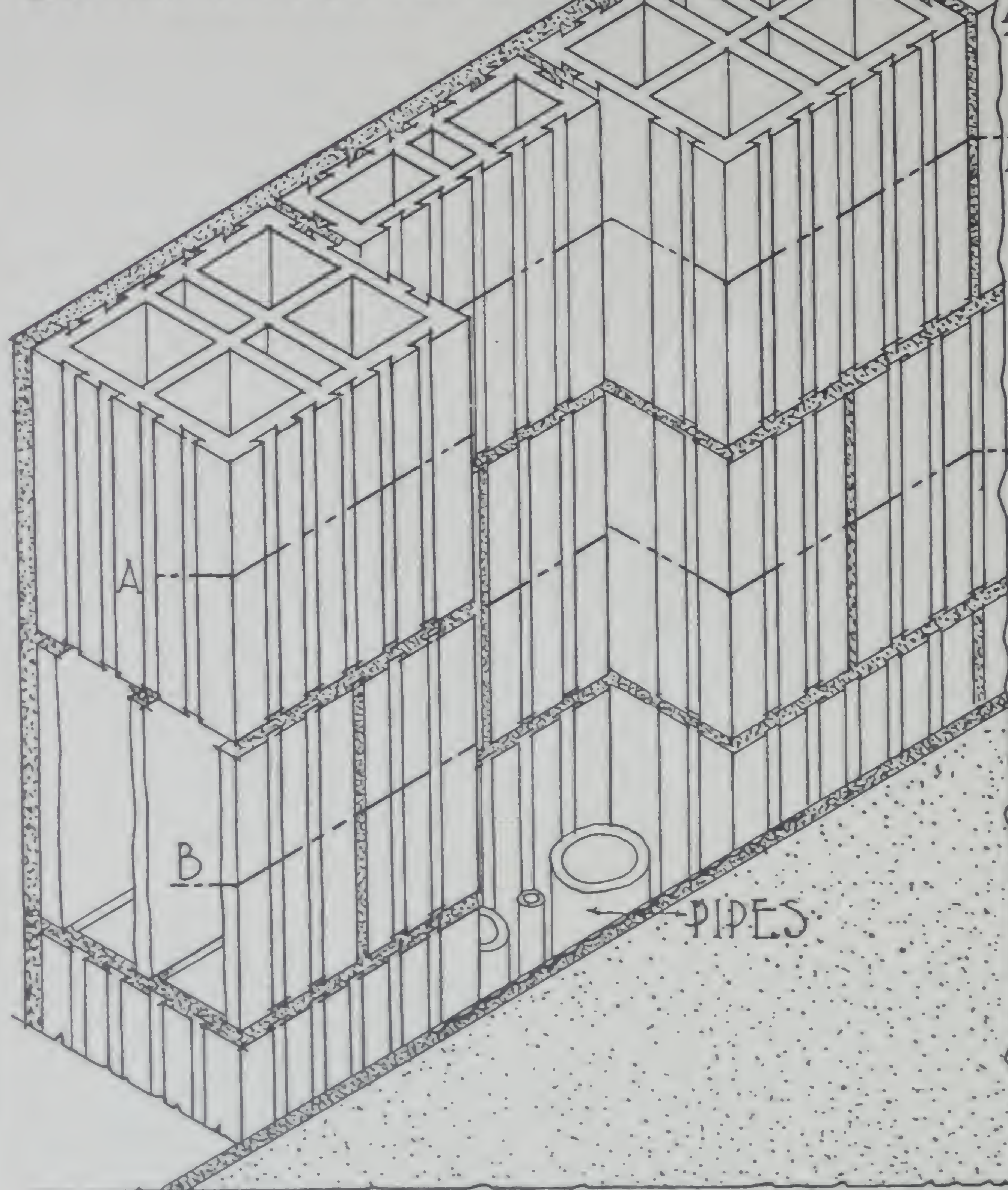


ISOMETRIC VIEW OF 14" TILE WALL

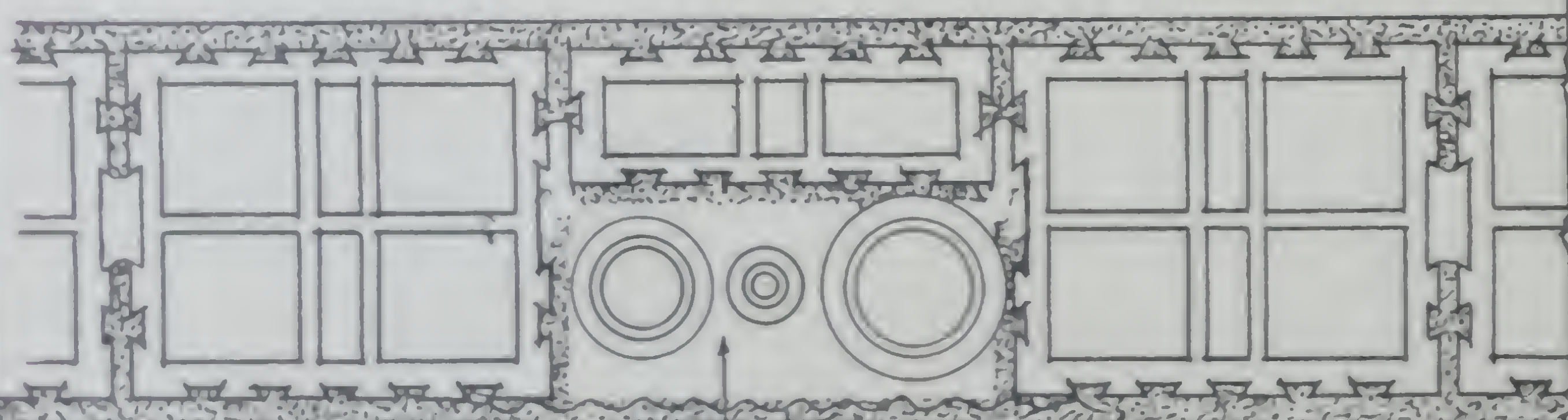


METHOD OF CHASING IN NATCO

EXTERIOR STUCCO

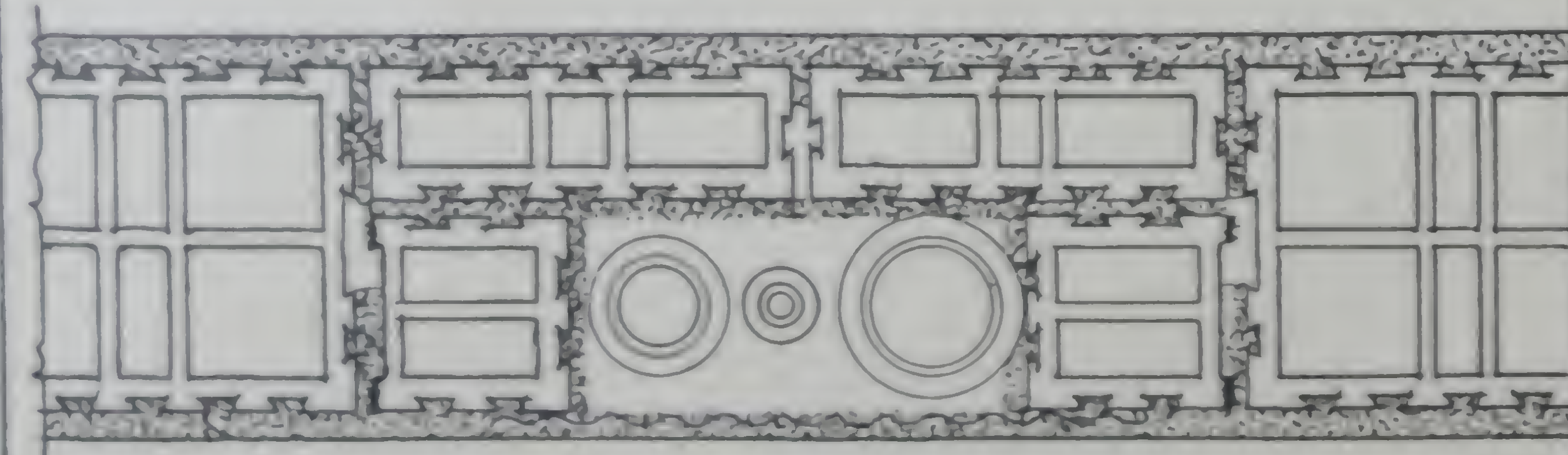


ISOMETRIC VIEW SHOWING 6" X 12" CHASE FOR PIPES IN 10" NATCO TILE WALL.



PIPE CHASE

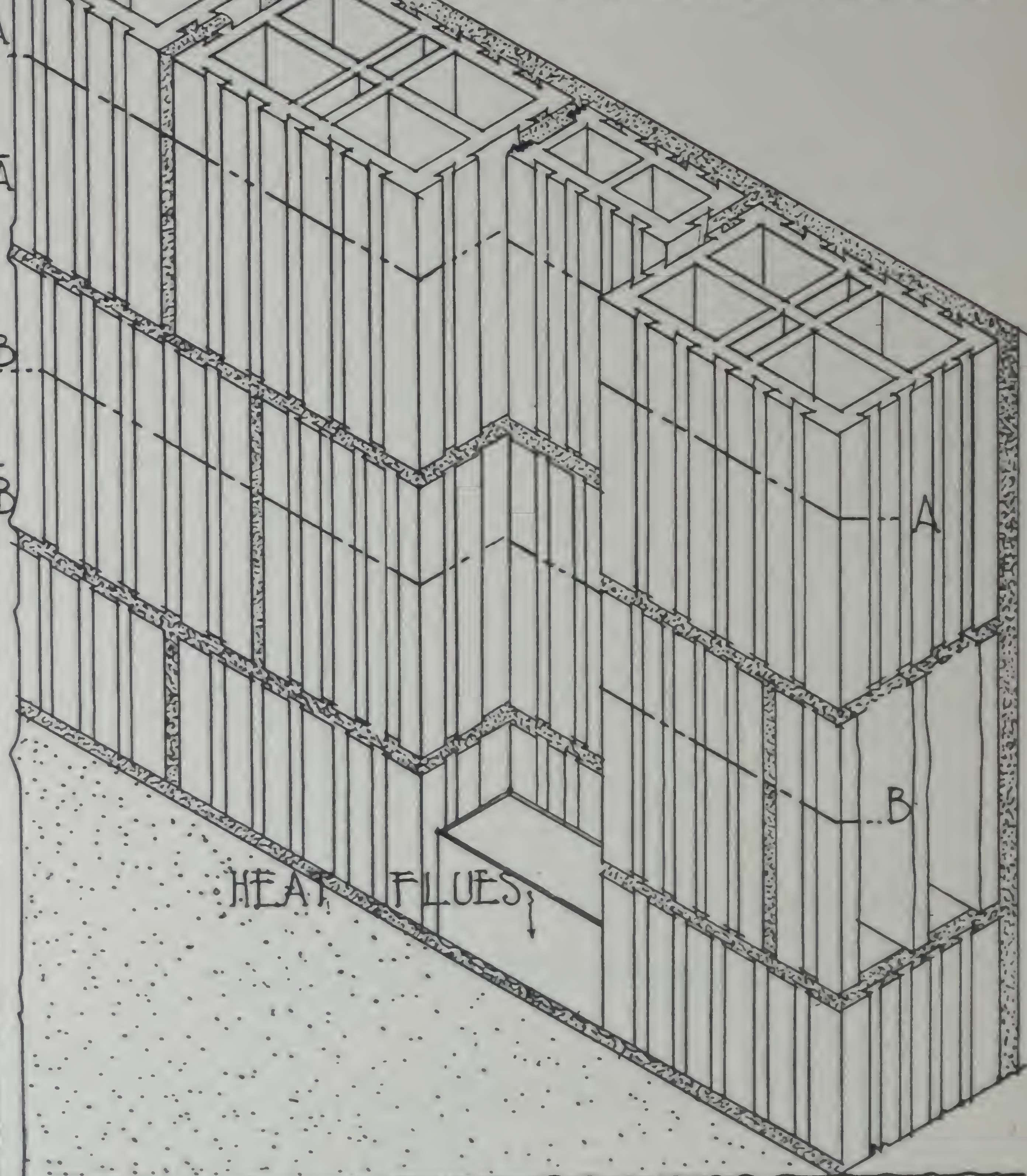
PLAN THRU LINE A-A



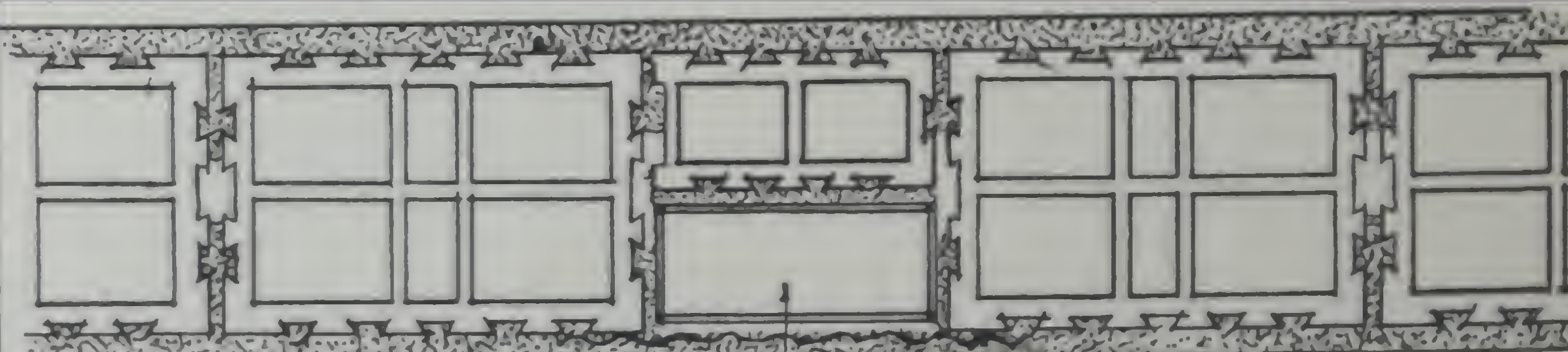
PLAN THRU LINE B-B

WALLS FOR HEAT PIPES ETC.

EXTERIOR STUCCO

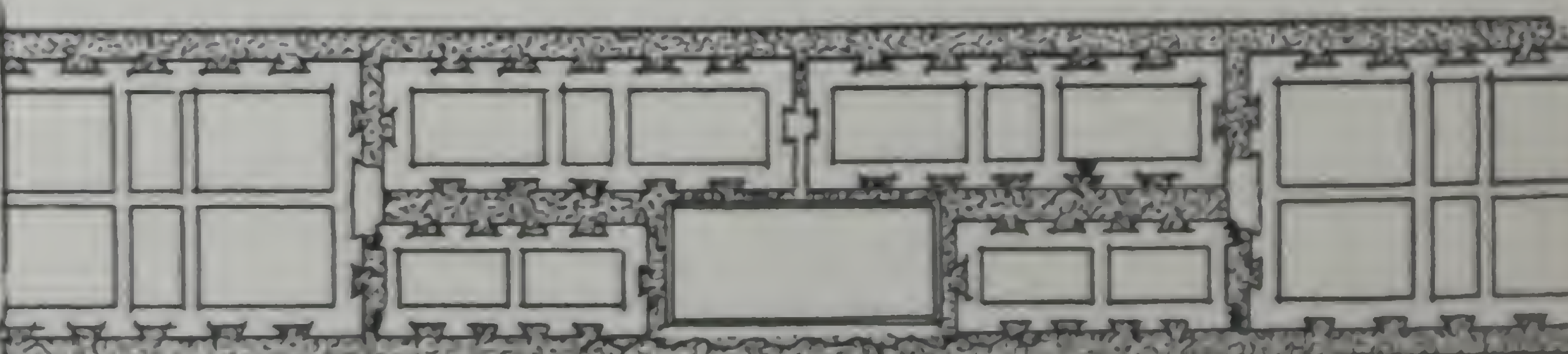


ISOMETRIC VIEW SHOWING 4" X 9" CHASE FOR PIPES IN 8" NATCO TILE WALL.



HEAT FLUE

PLAN THRU LINE A-A



PLAN THRU LINE B-B



DETAIL OF TYPICAL DOUBLE HUNG WINDOW CONSTRUCTION

SCALE 16 INCHES

NATCO ARCH LINTEL WITH SKEW BACKS  
NECESSARY FILLERS & KEY ADAPTED TO OPENINGS NOT EXCEEDING  
5'-0" IN CLEAR SPAN  
KEY FILLER SKEWBACK

STVCCO COVERING

ELEVATION

CALKED WITH  
ROOFERS CEMENT

PLAN SHOWING SPECIAL JAMB TILE

CONCRETE FILL

PLASTER

REINFORCING  
RODS

STVCCO

ROOFERS CEMENT

ROOFERS  
CEMENT

STONE

SECTION OF HEAD OF REGULAR TILE

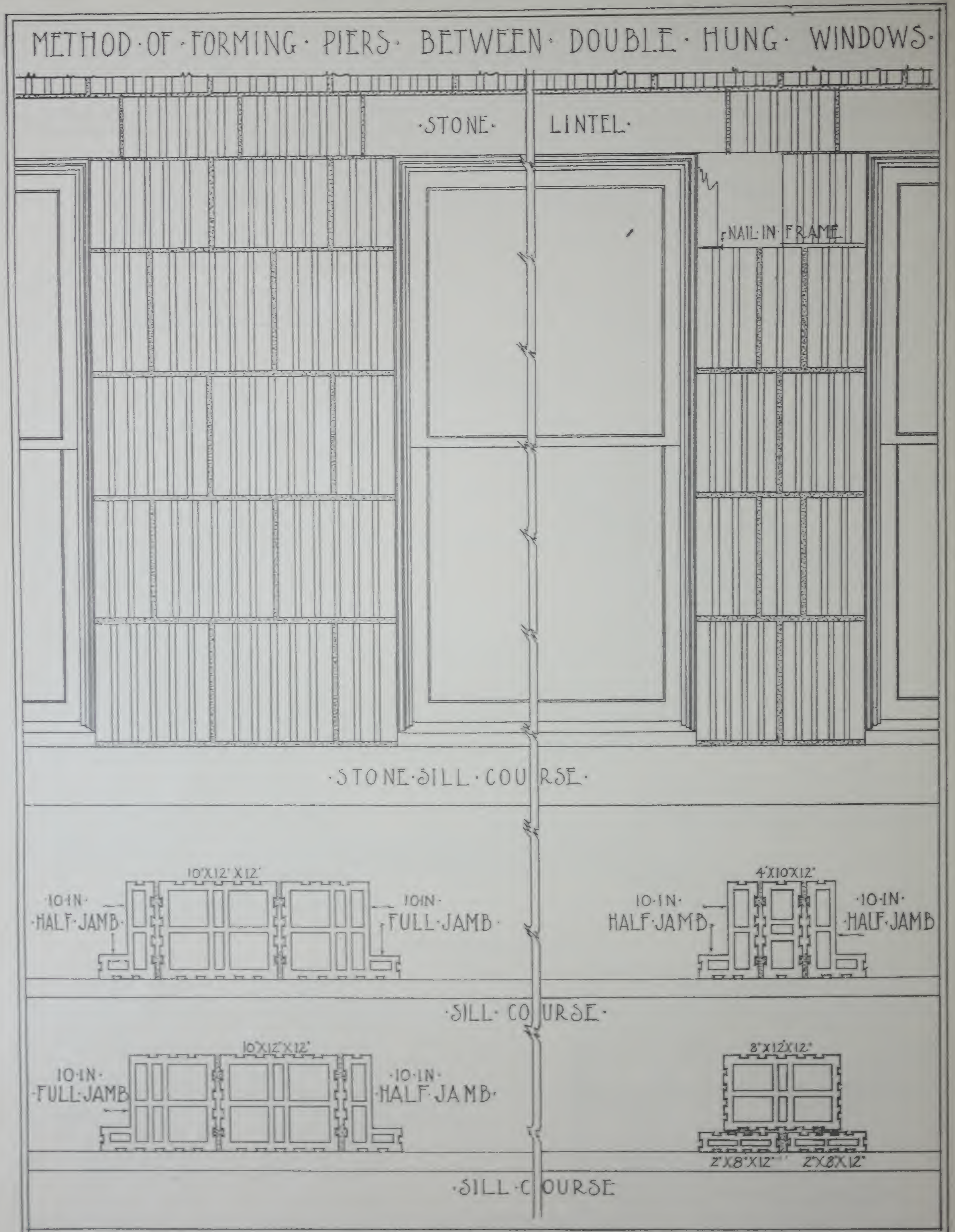
SECTION OF HEAD OF SPECIAL TILE

SECTION OF PATENTED TILE SILL

SECTION OF STONE SILL



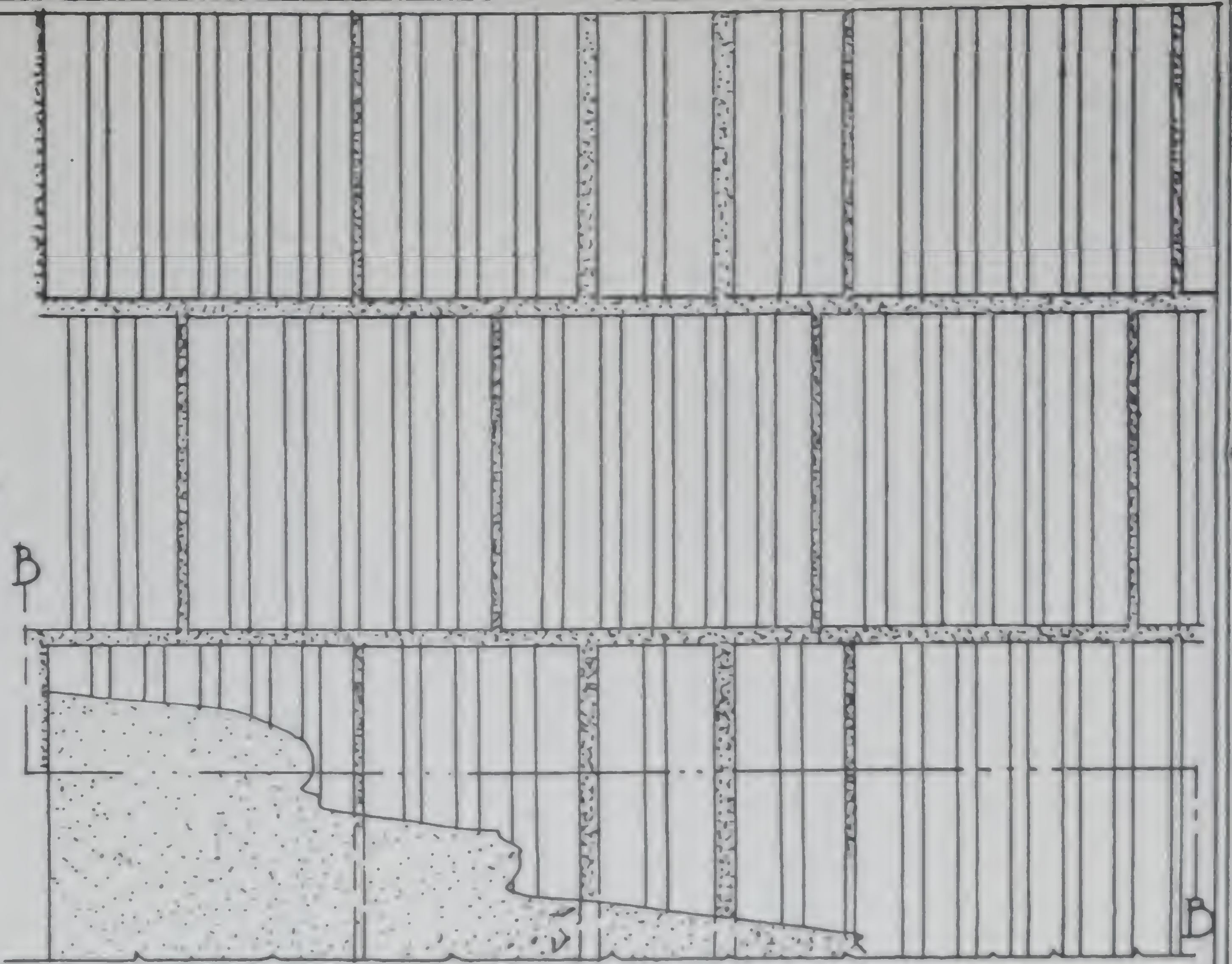
METHOD OF FORMING PIERS BETWEEN DOUBLE HUNG WINDOWS.



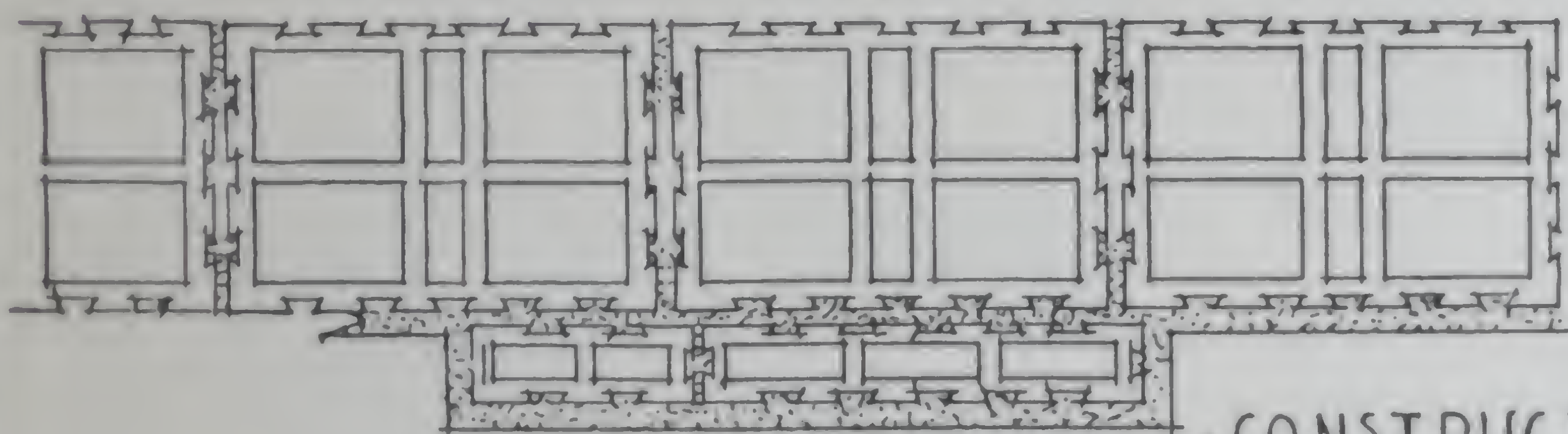




• ELEVATION • OF • PIER • SIDE •



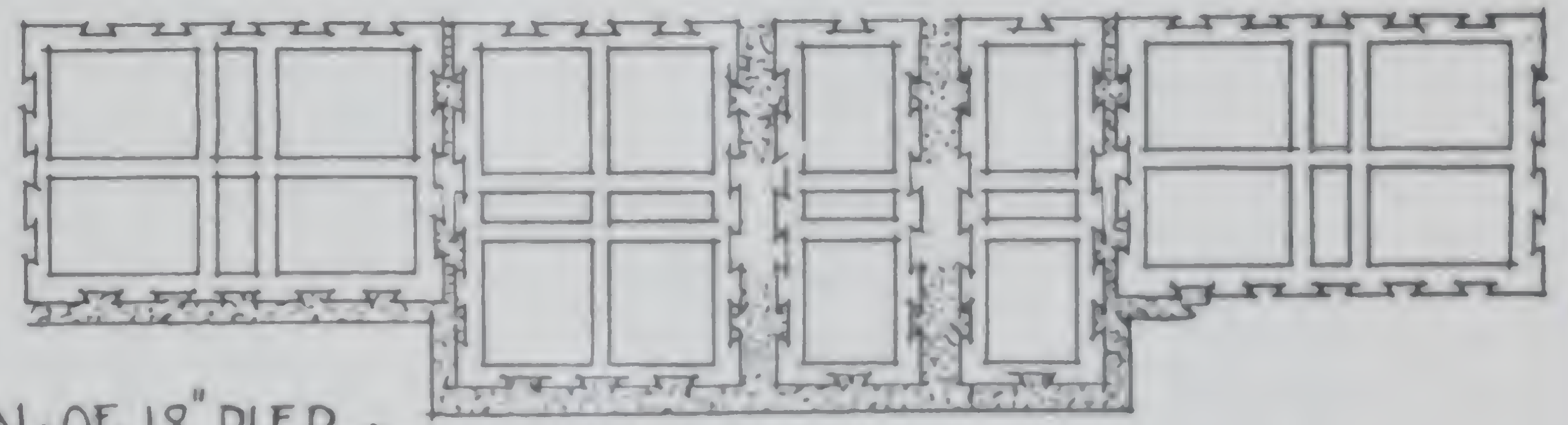
• ELEVATION • OF • WALL • SIDE •



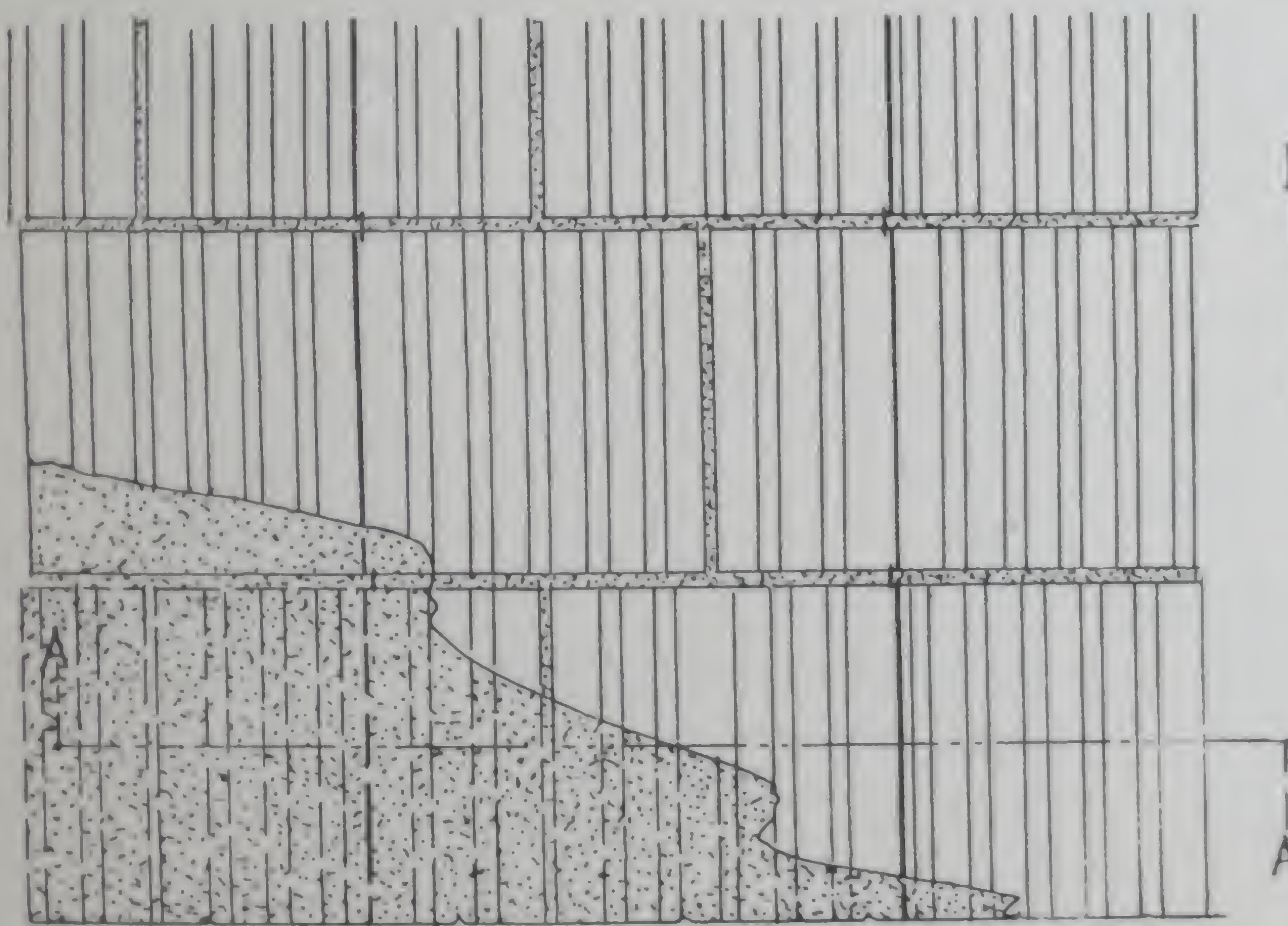
• PLAN • AT • COURSE • A • A •

• CONSTRUCTION • OF • 18" PIER •

• IN • AN • 8" HOLLOW • TILE • WALL •



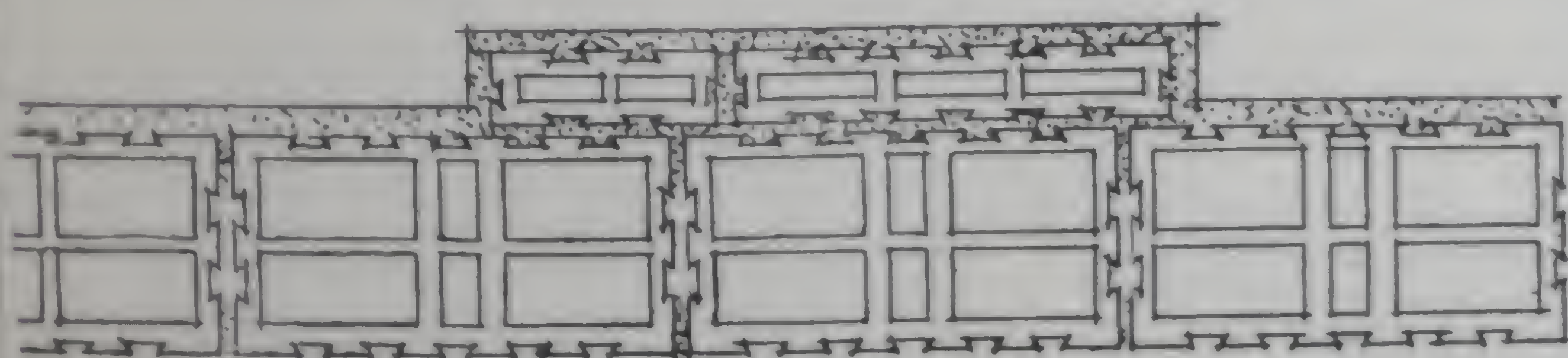
• PLAN • AT • COURSE • B • B •



• ELEVATION • OF • PIER • SIDE •



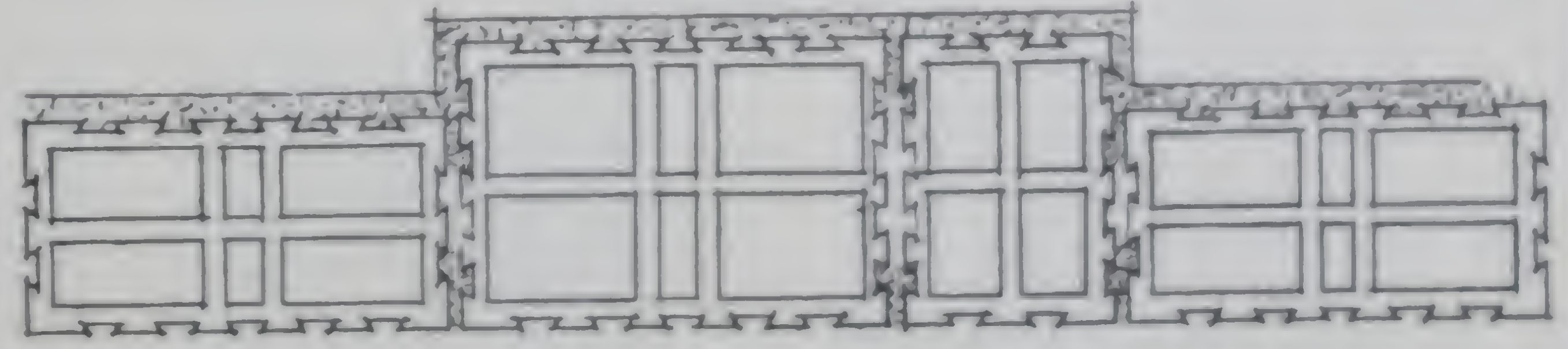
• ELEVATION • OF • WALL • SIDE •



• PLAN • AT • COURSE • A • A •

• CONSTRUCTION • OF • 18" PIER •

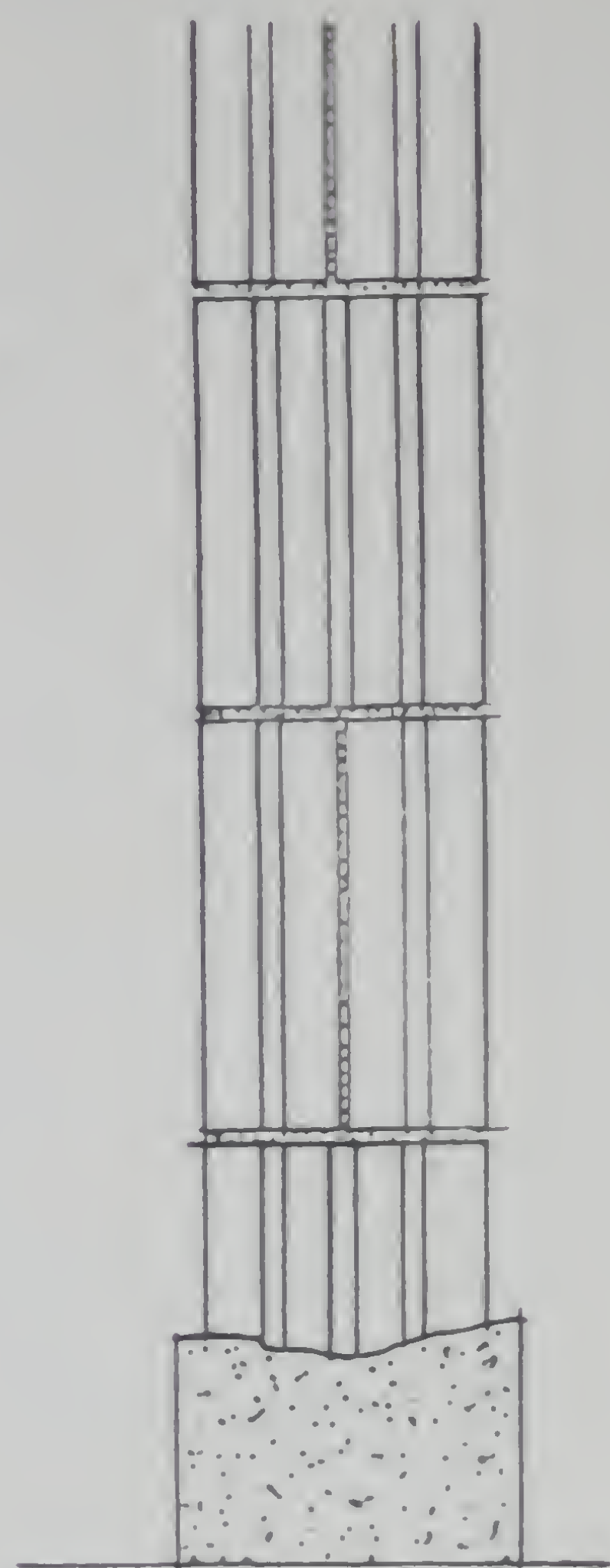
• IN • A • 6" HOLLOW • TILE • WALL •



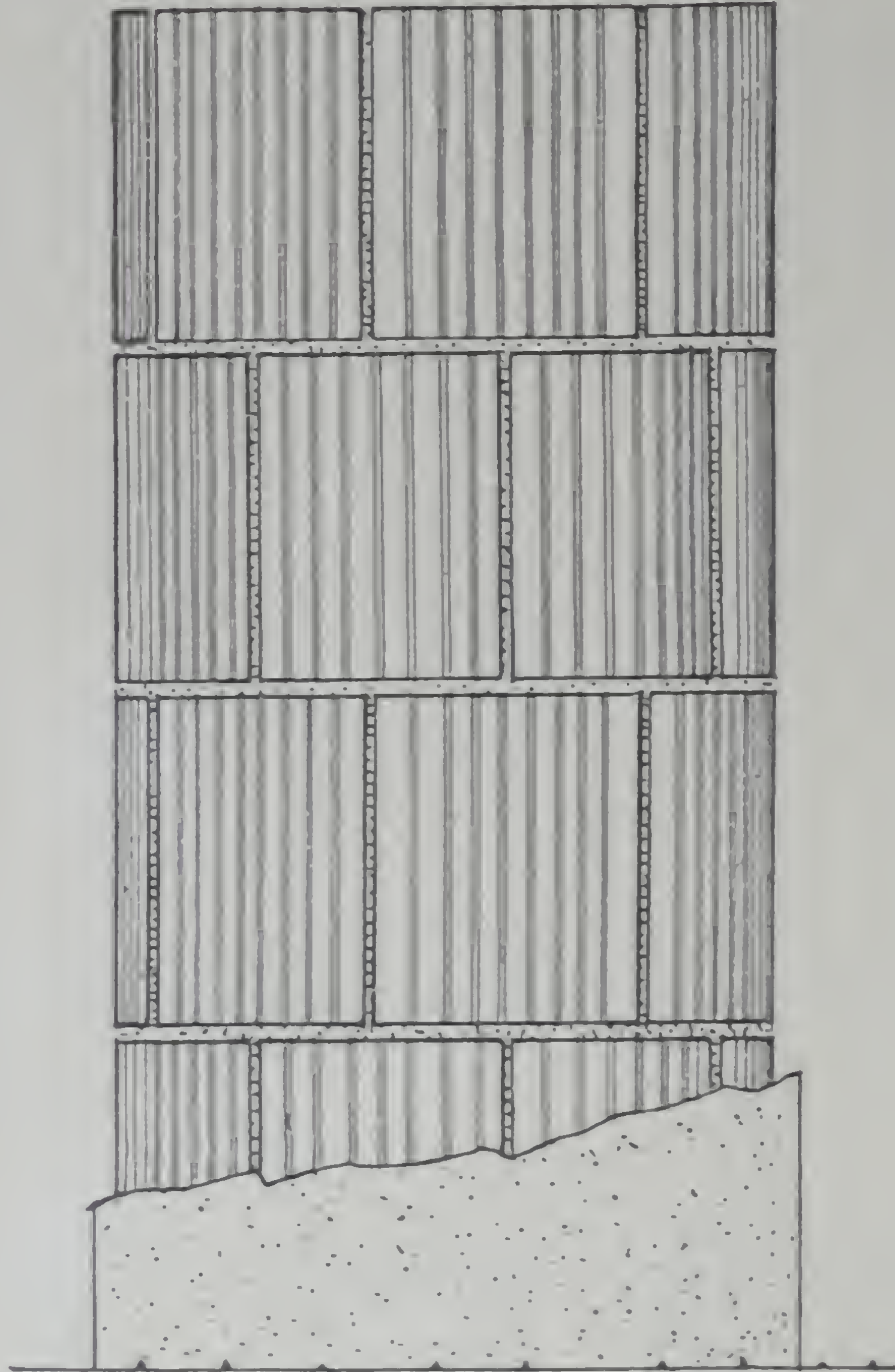
• PLAN • AT • COURSE • B • B •



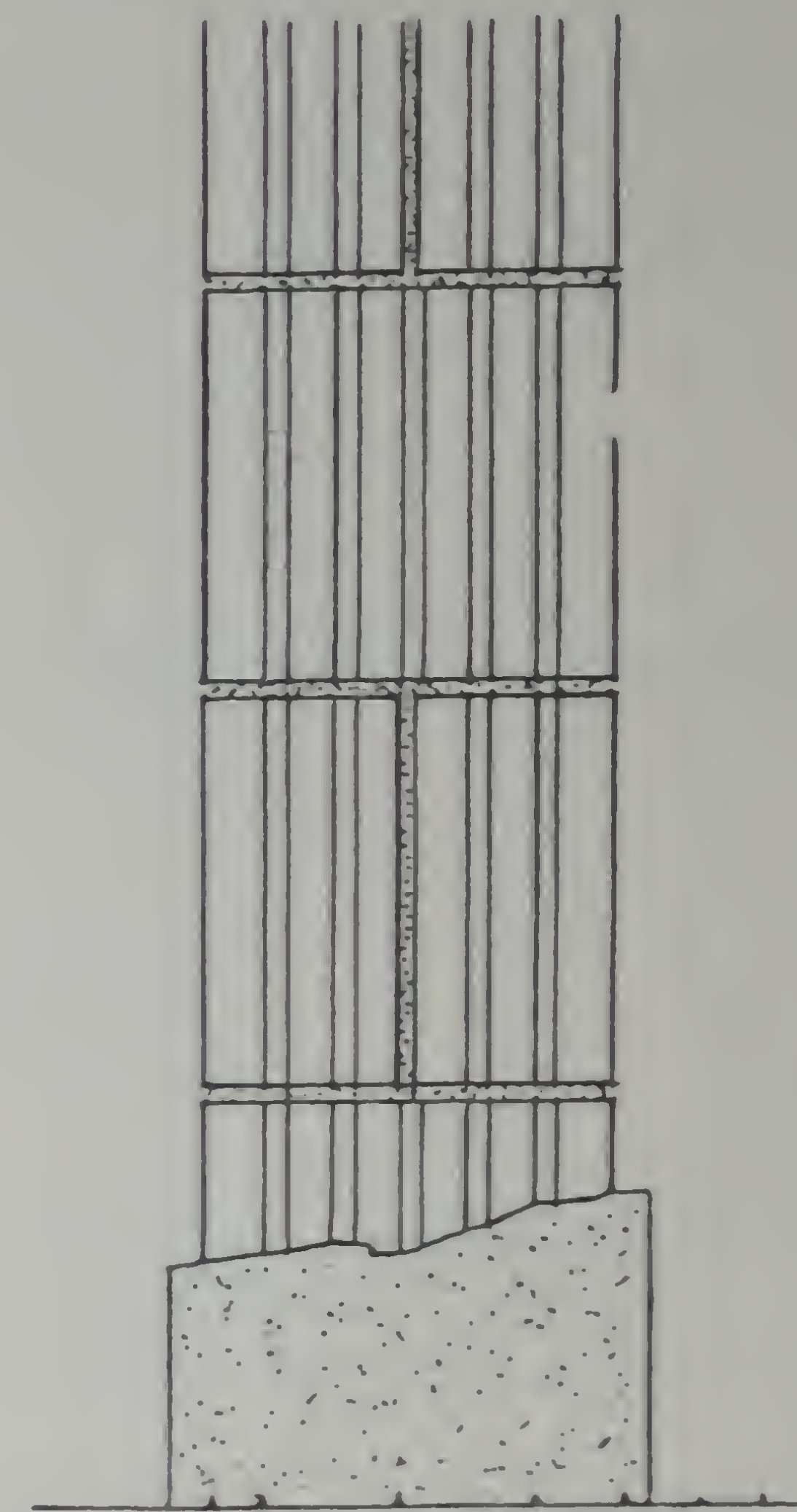
DETAIL OF HOLLOW TILE PIERS WITH STVCCO COVERING



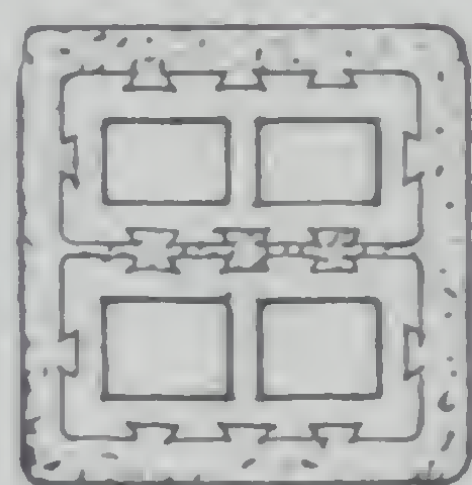
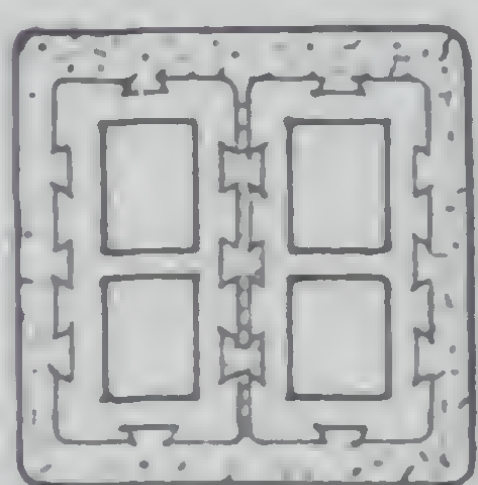
ELEVATION



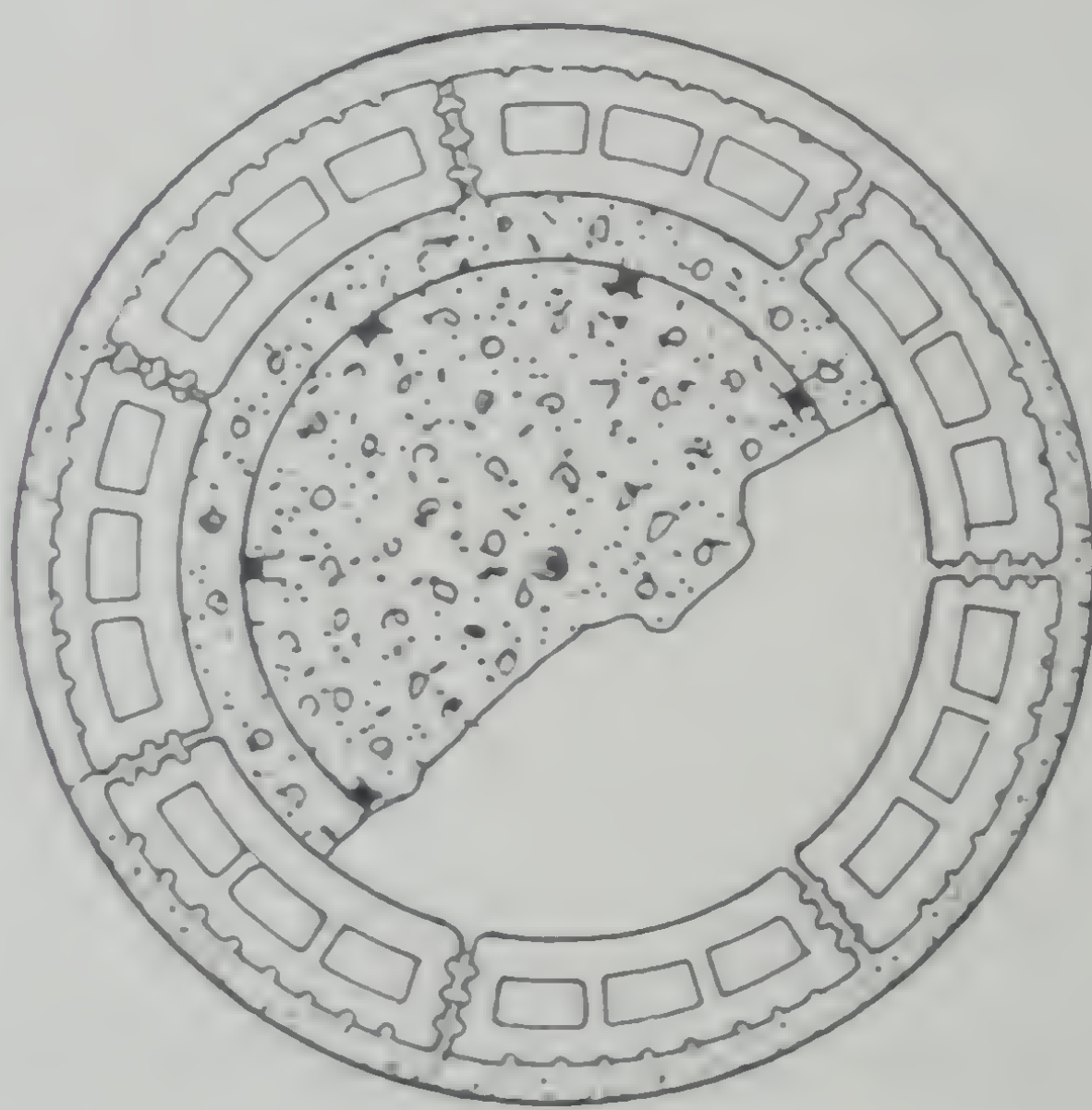
ELEVATION



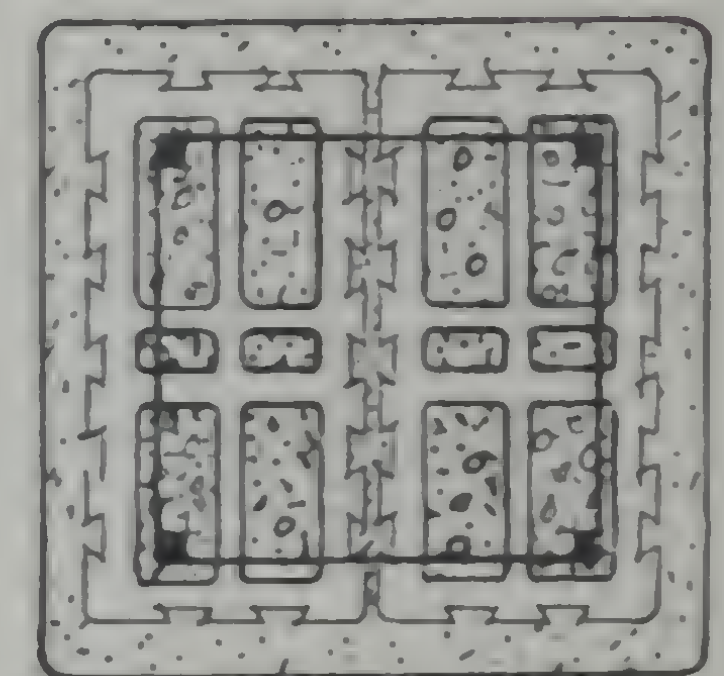
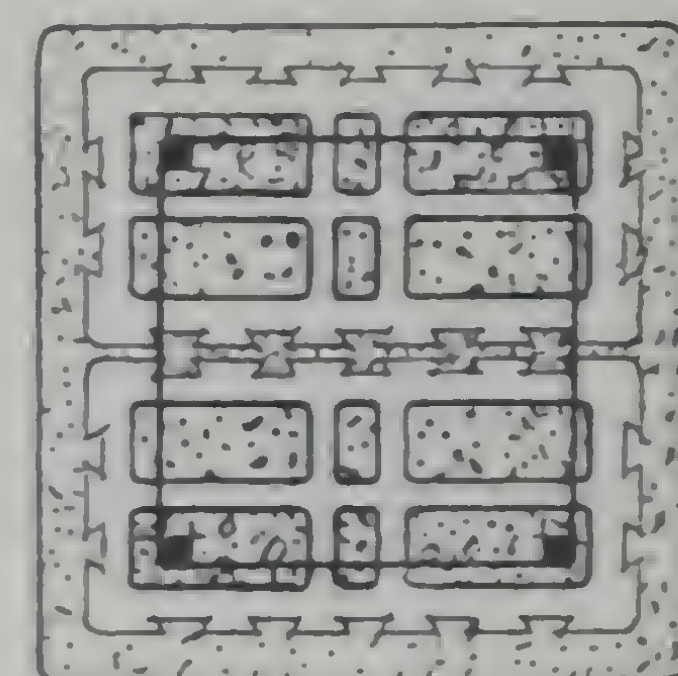
ELEVATION



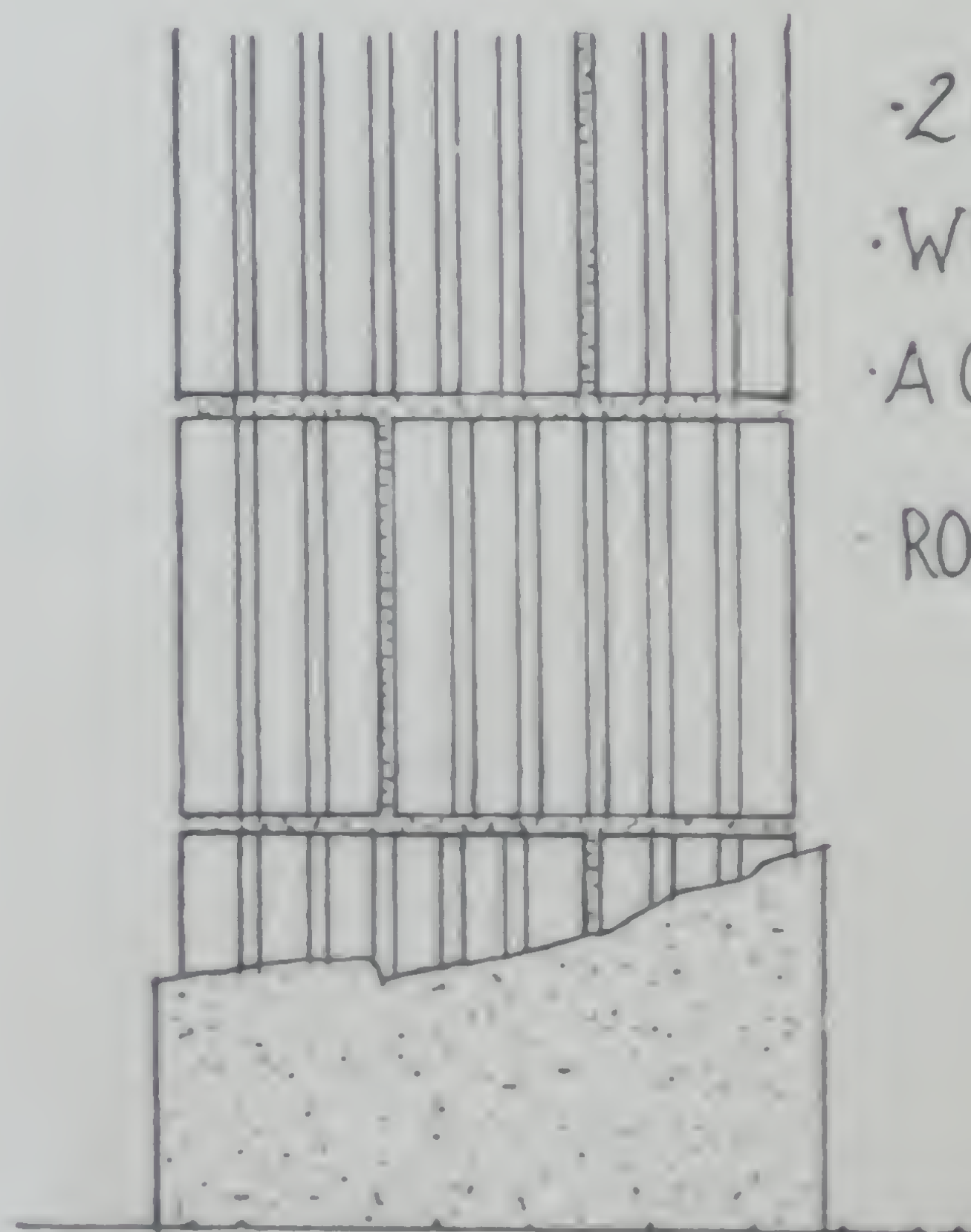
PLANS OF 10' TILE PIER 4'x8' TILE



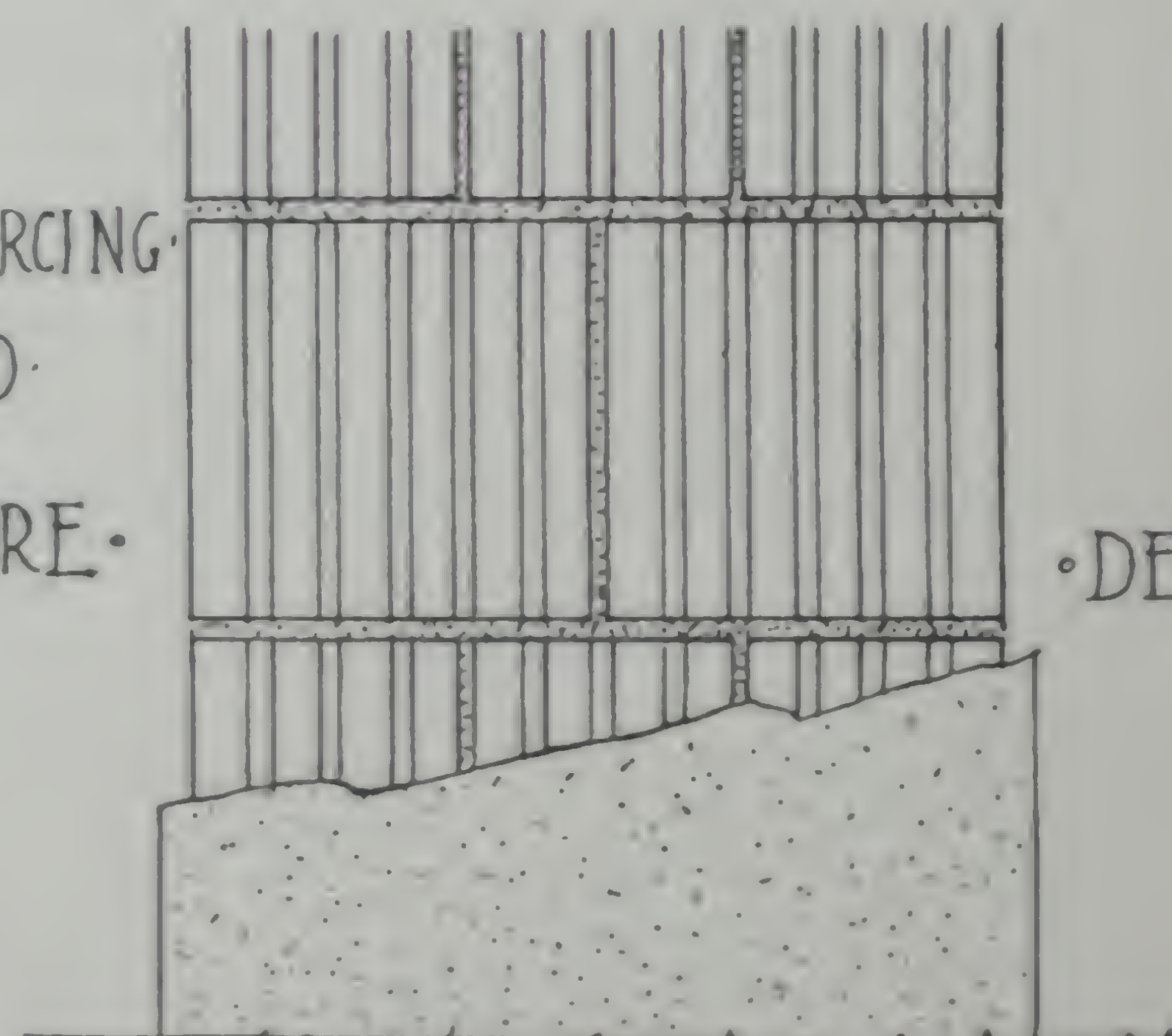
26' ROUND COLUMN  
WITH OR WITHOUT REINFORCING  
ACCORDING TO LOAD  
RODS WRAPPED WITH WIRE



14' TILE PIER FILLED WITH CONCRETE  
AND REINFORCING RODS AT CORNERS  
TIED WITH  $\frac{1}{4}$ " BANDS



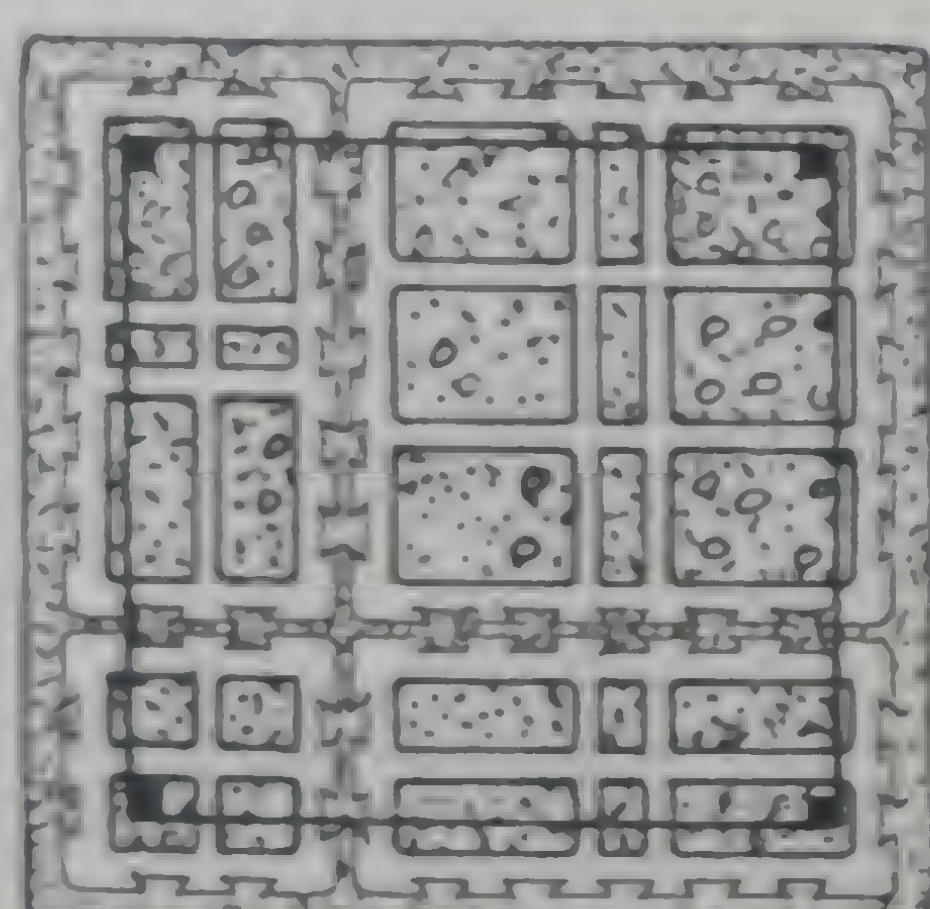
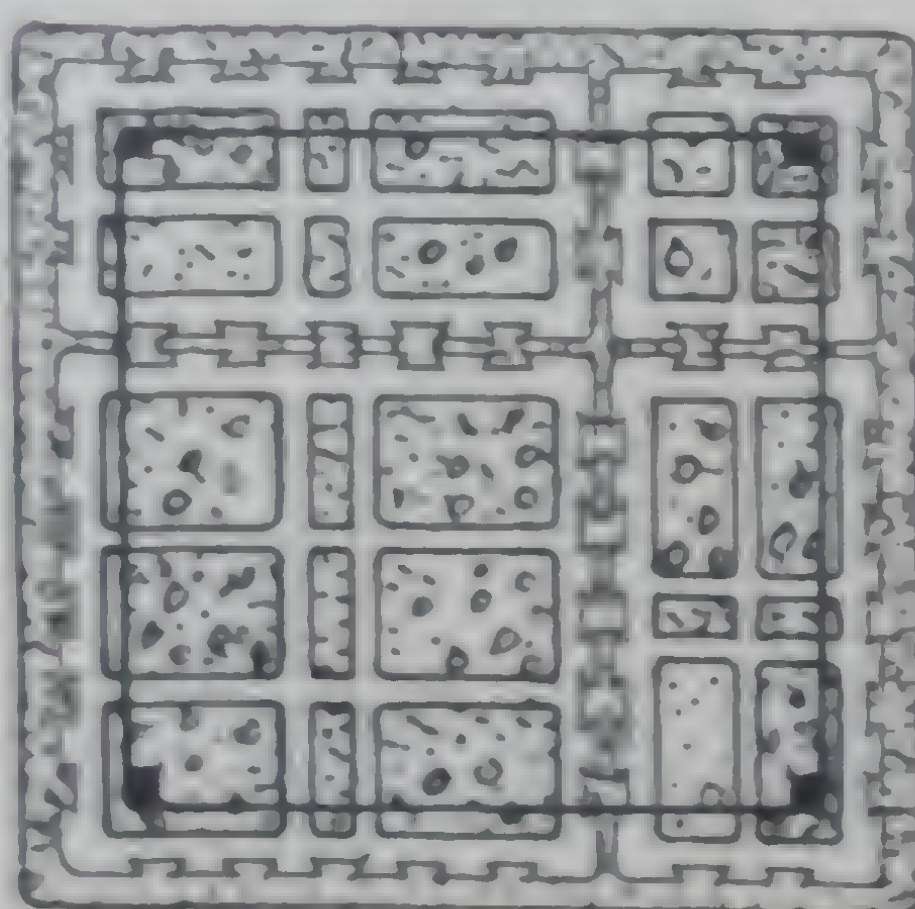
ELEVATION



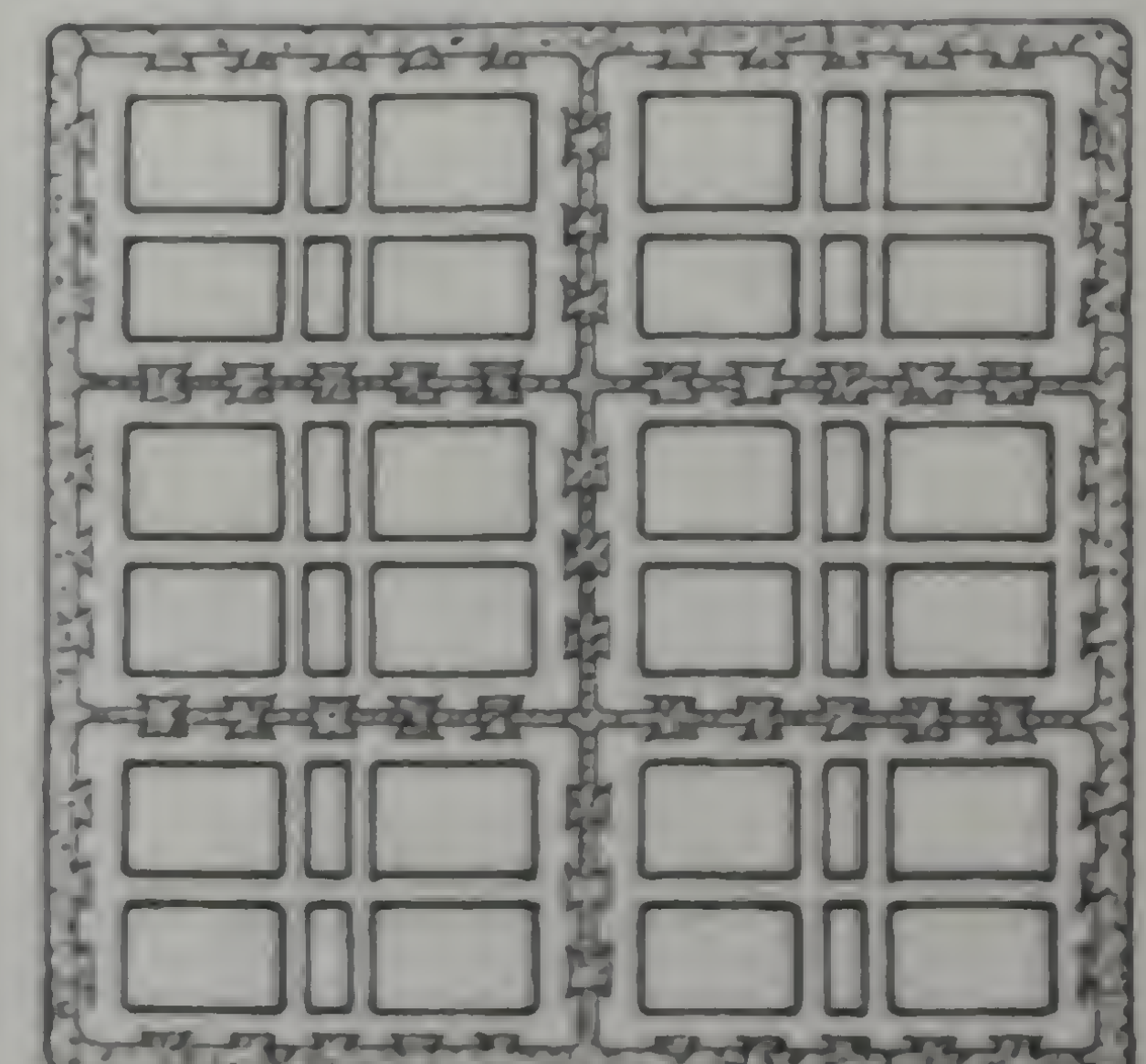
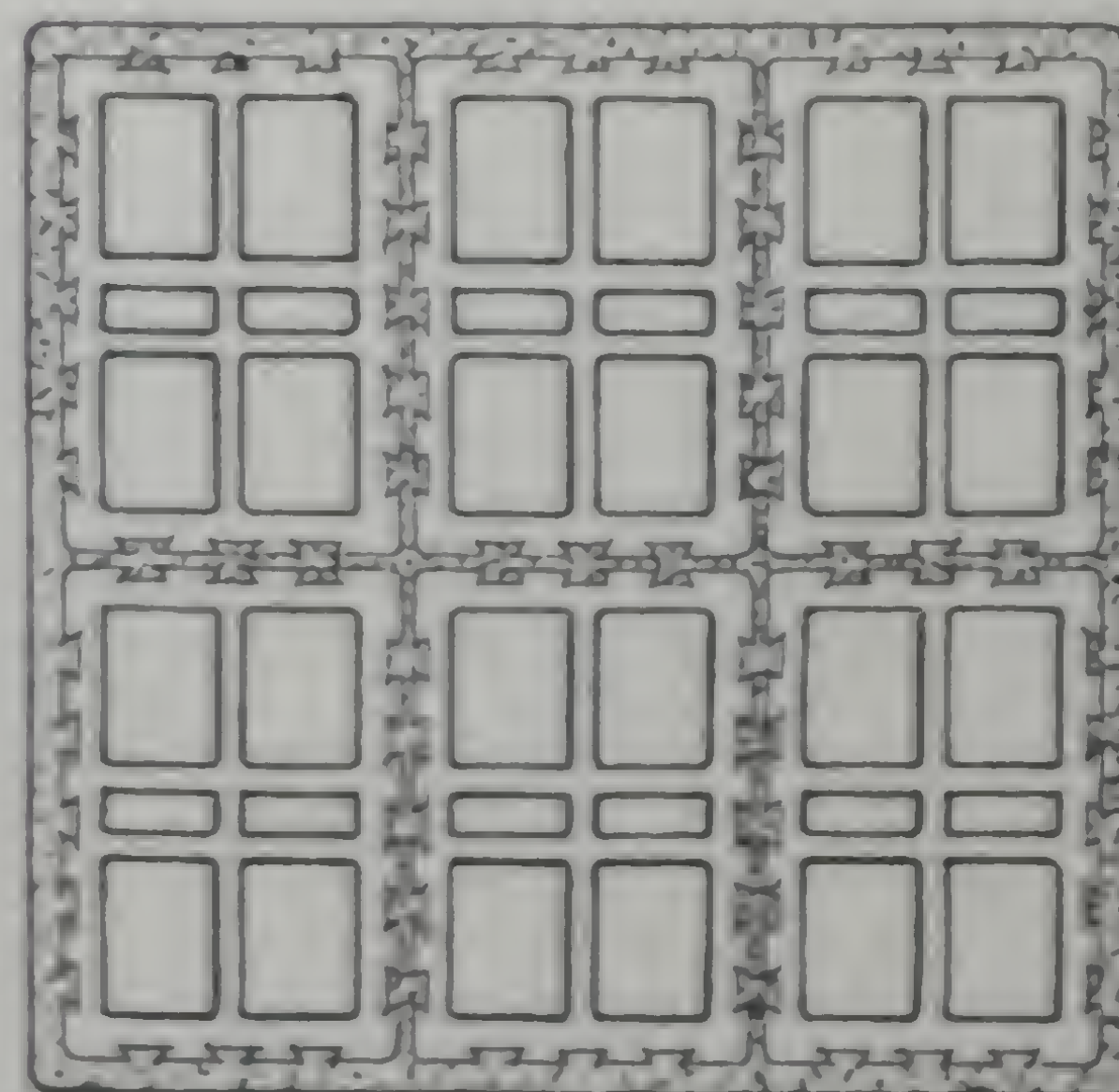
ELEVATION



DETAIL OF BAND



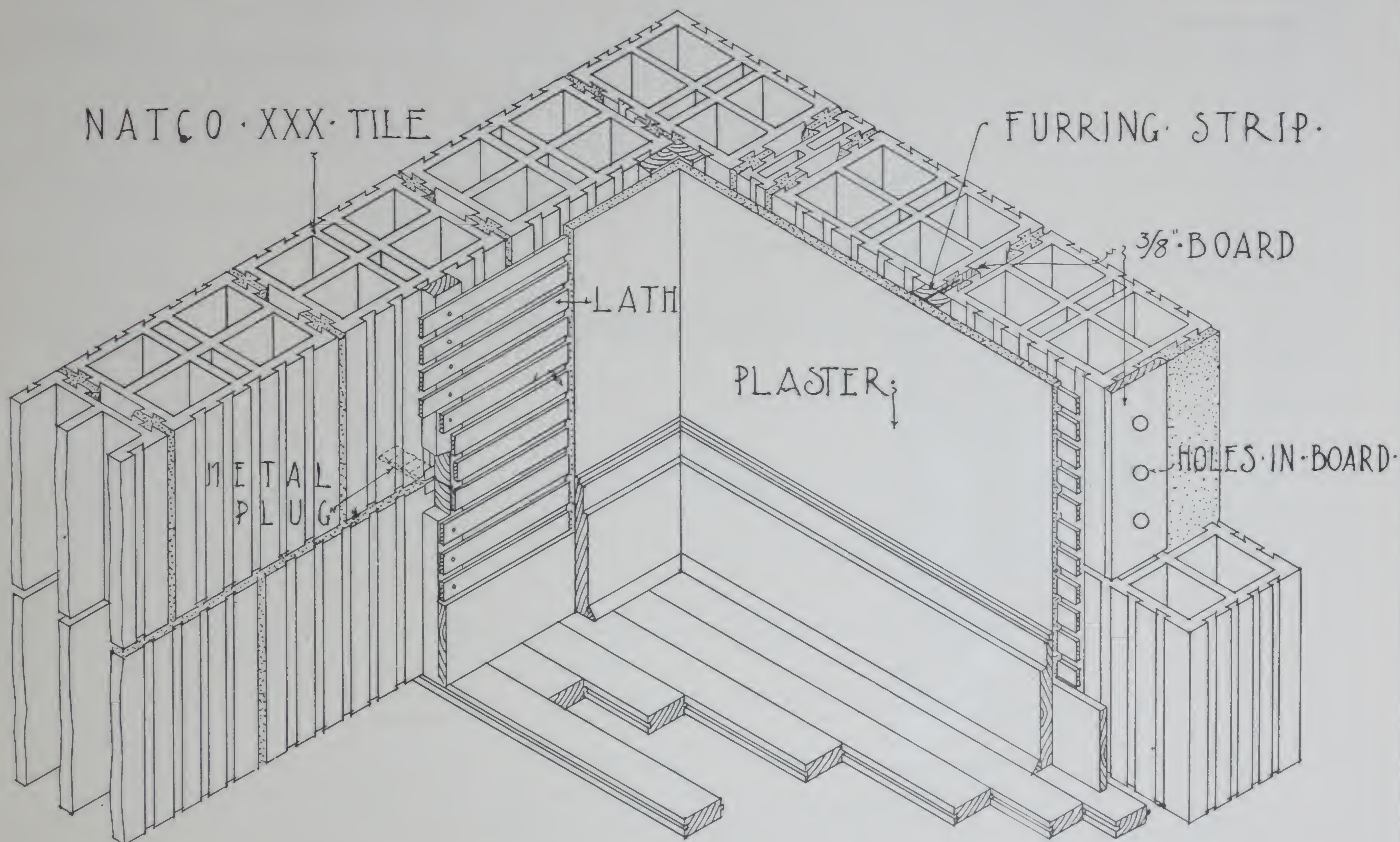
PLANS OF 20' PIER REINFORCING AT CORNERS  
TIED WITH  $\frac{1}{4}$ " BANDS



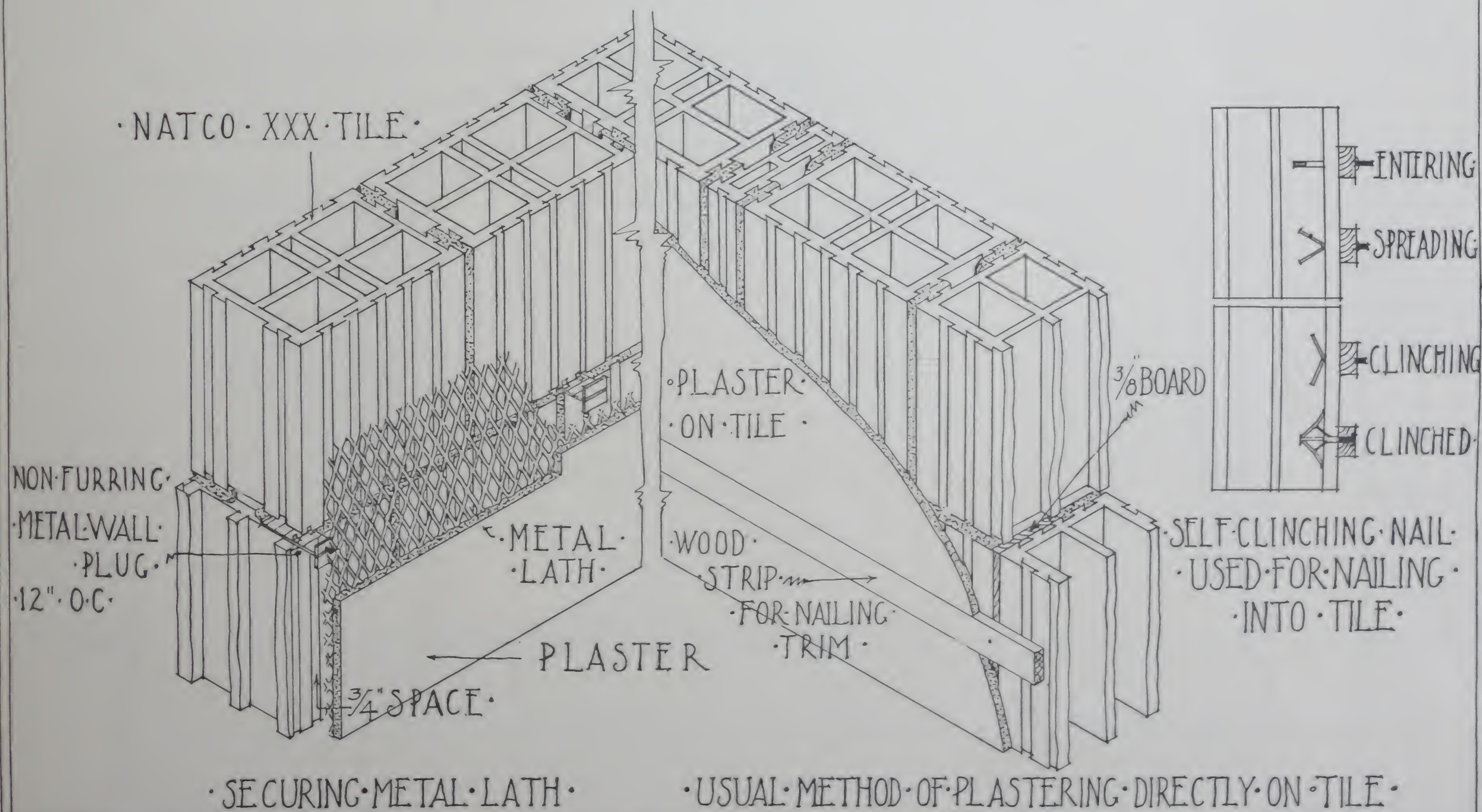
PLANS OF 26' PIERS



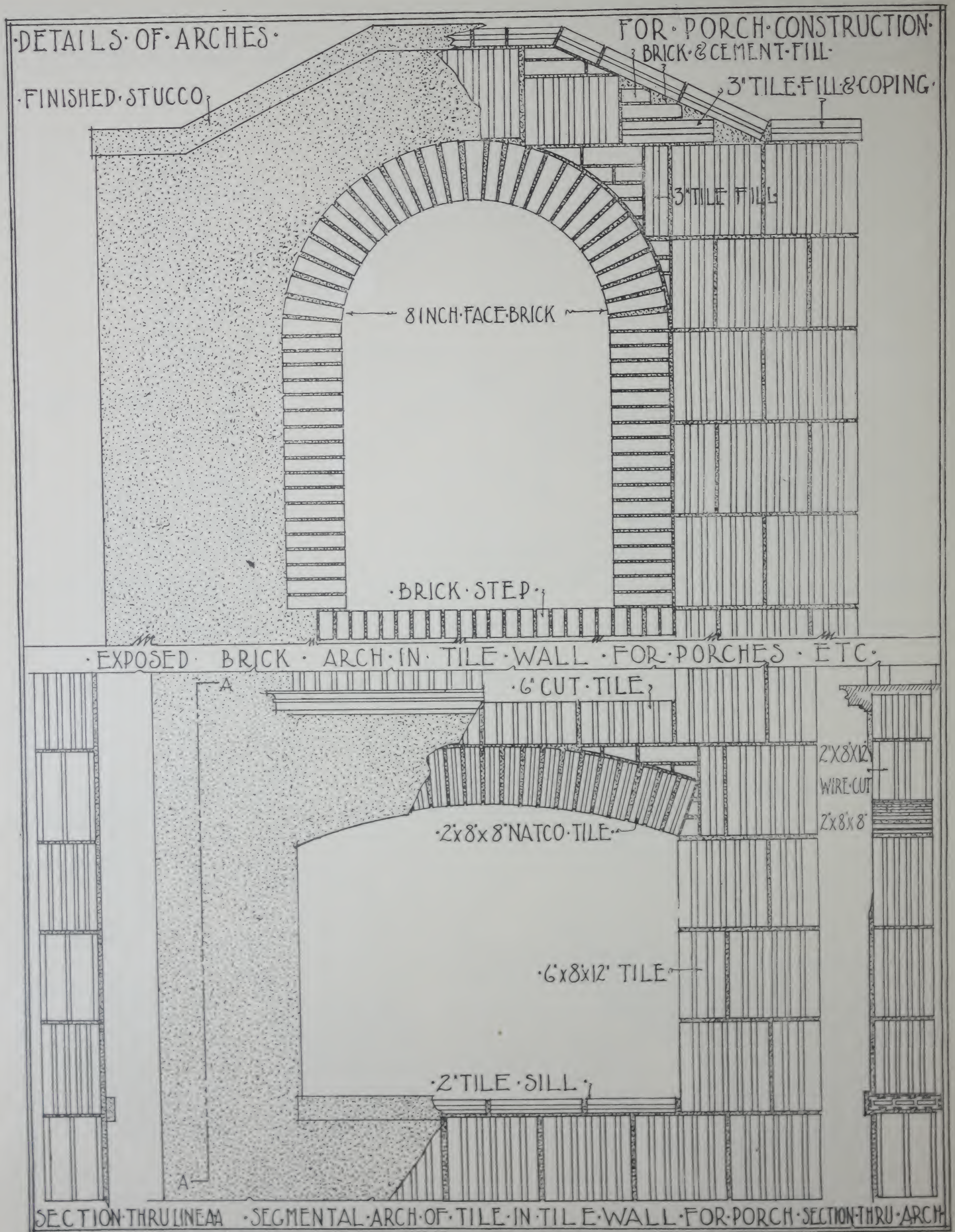
METHOD OF FASTENING TRIM AND FURRING TO NATCO WALLS.



WOOD & METAL PLUGS IN NATCO TILE CONSTRUCTION.

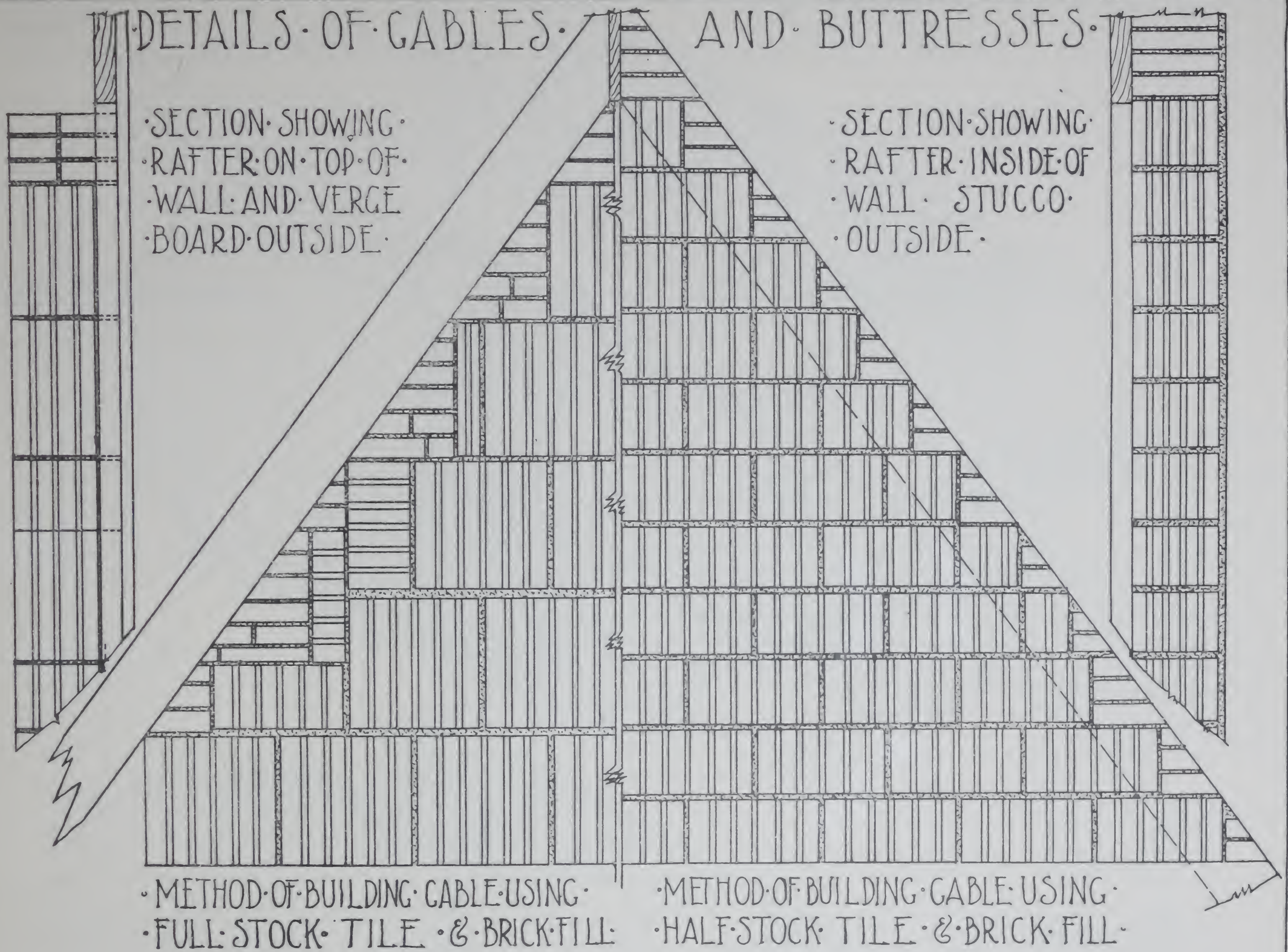




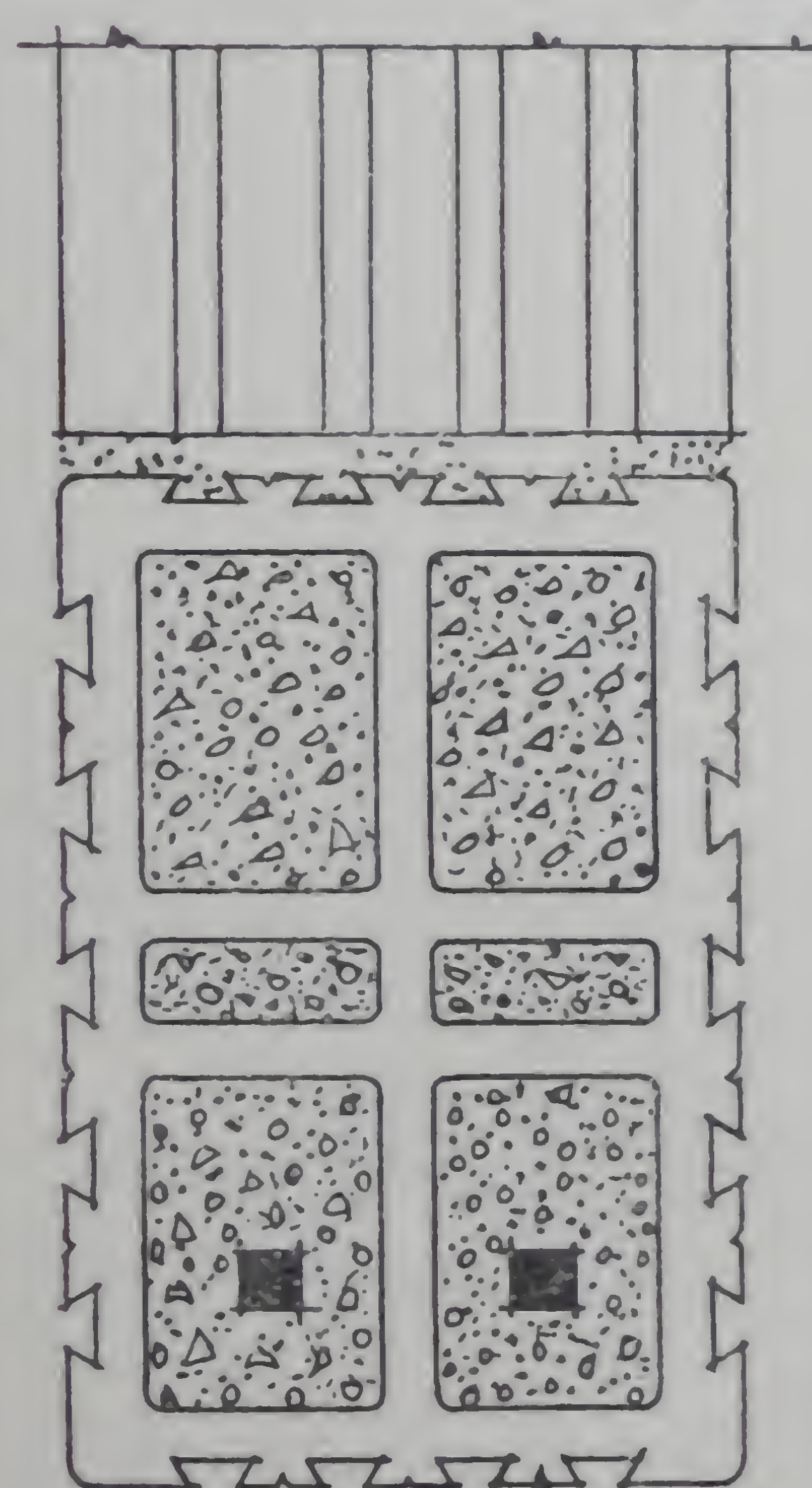




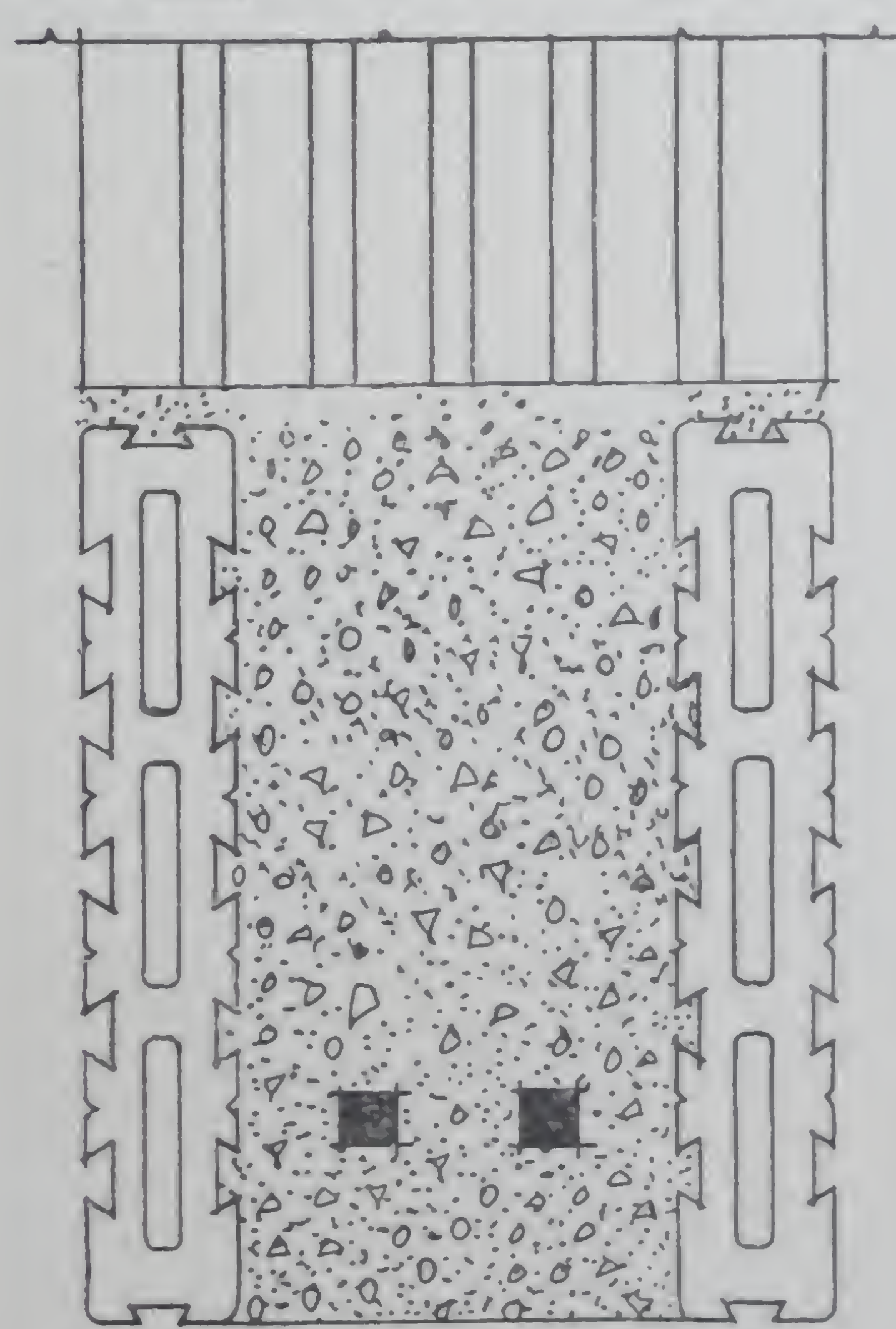
# DETAILS OF GABLES AND BUTTRESSES.



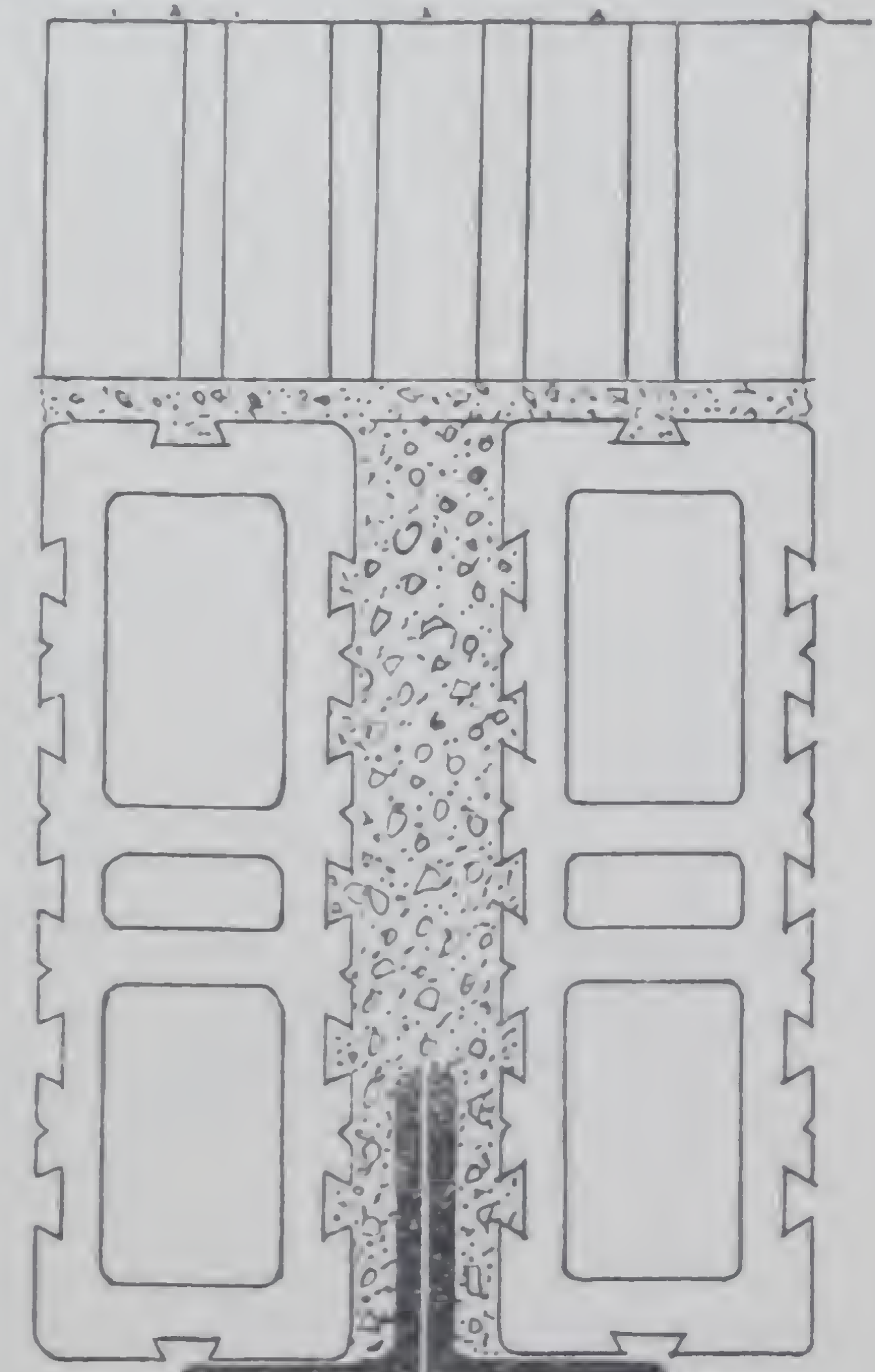
## LINTEL SECTIONS.



· STOCK TILE  
REINFORCED.



CONCRETE BEAM  
FACED WITH 2" TILE

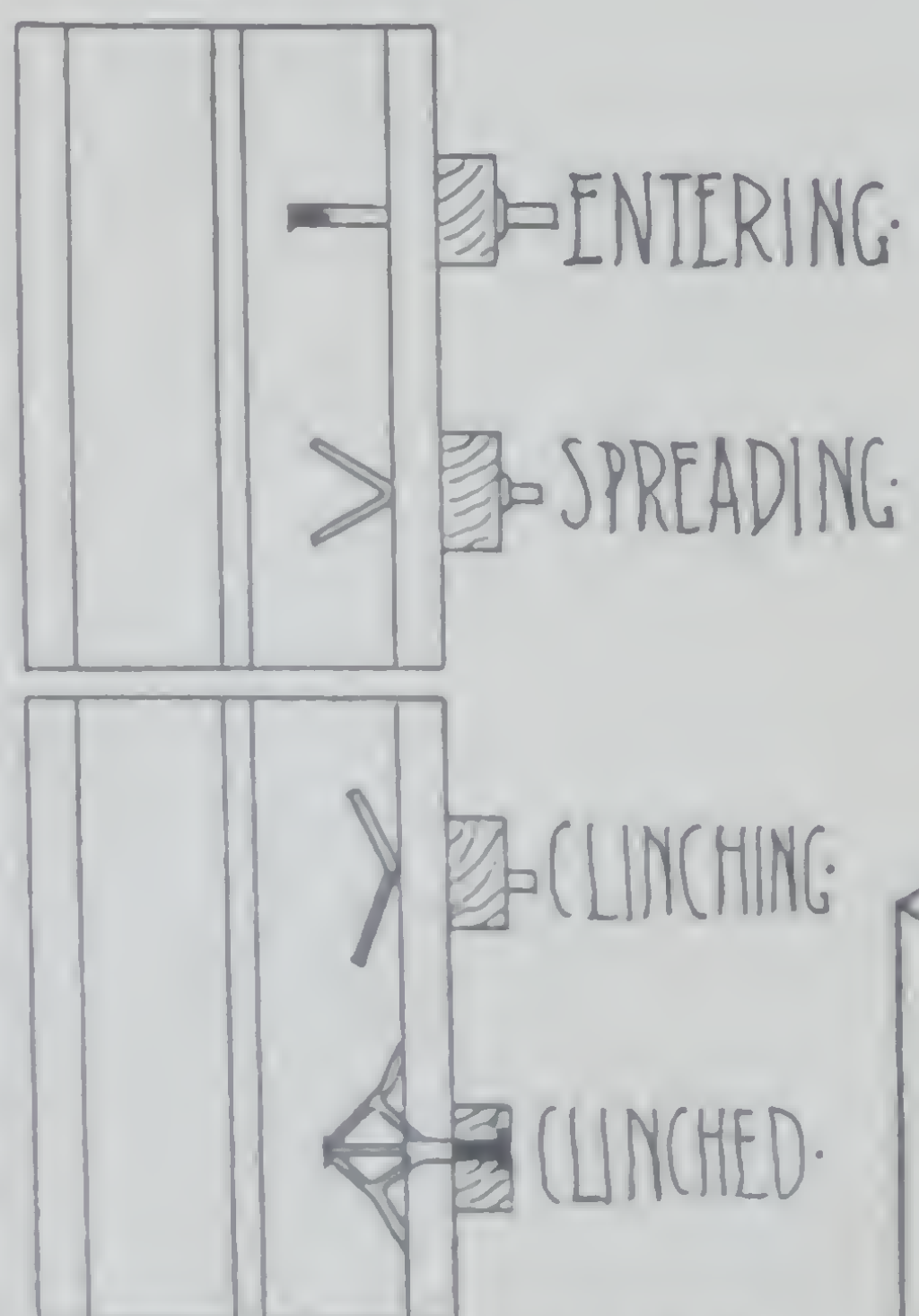
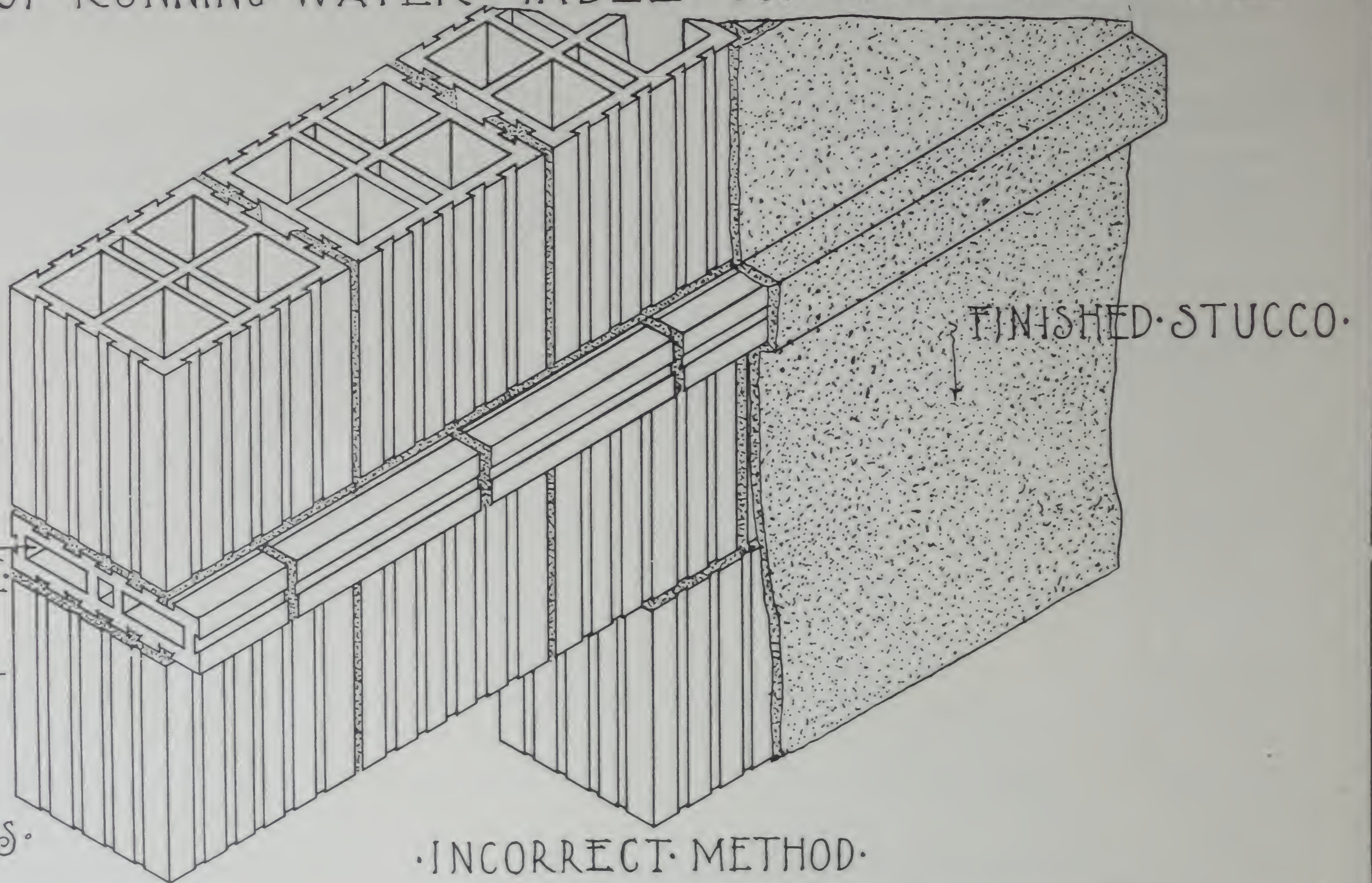


· STOCK 3/4" TILE  
· LINTEL WITH ANGLES.



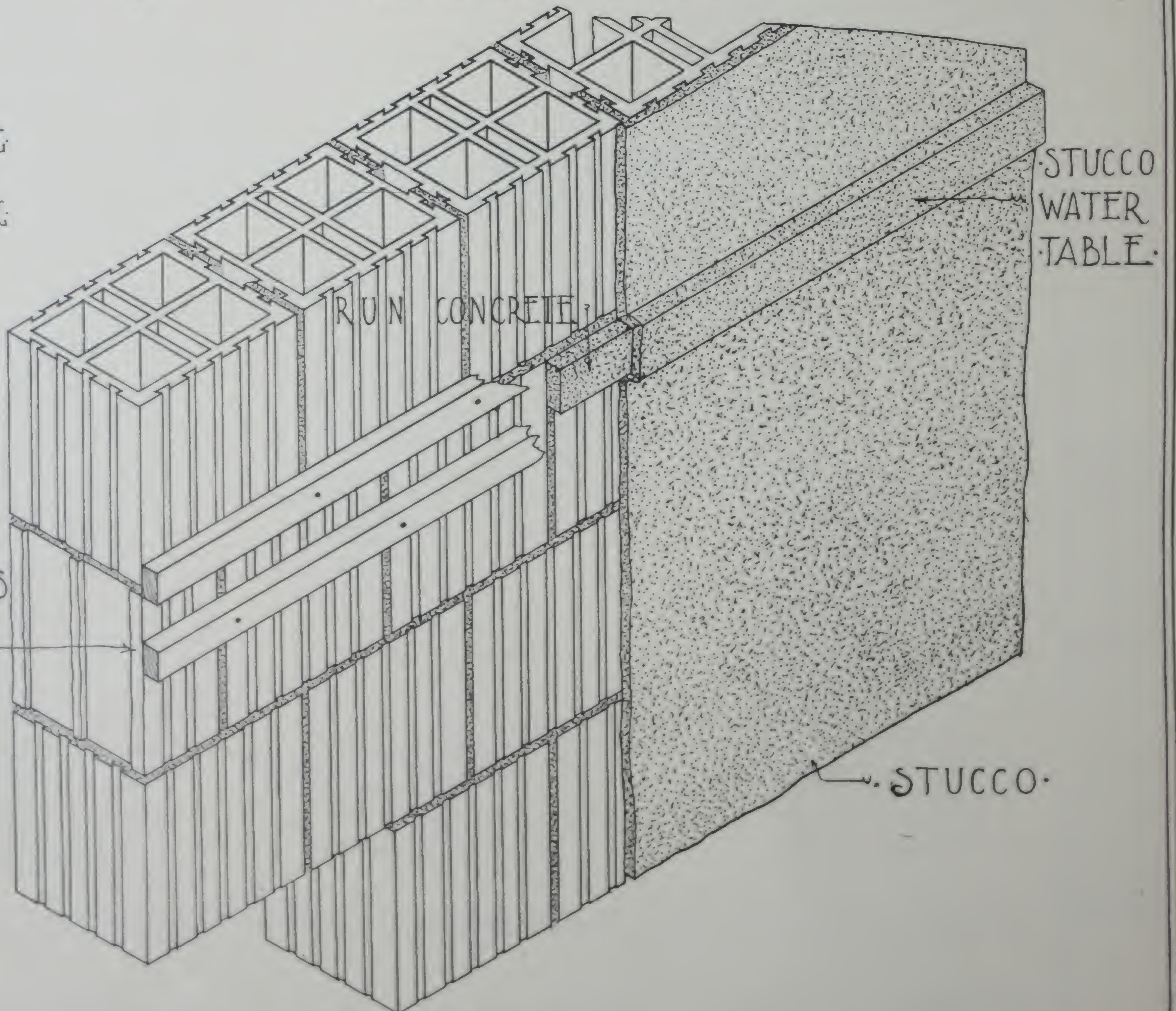
METHOD OF RUNNING WATER TABLE ON NATCO TILE WALL.

WEAK POINT IN  
WALL DUE TO TILE  
LAID FLAT:  
FLAT BED CAUS-  
ING DAMPNESS  
AND DOES NOT  
ADMIT OF WEBS  
REGISTERING.



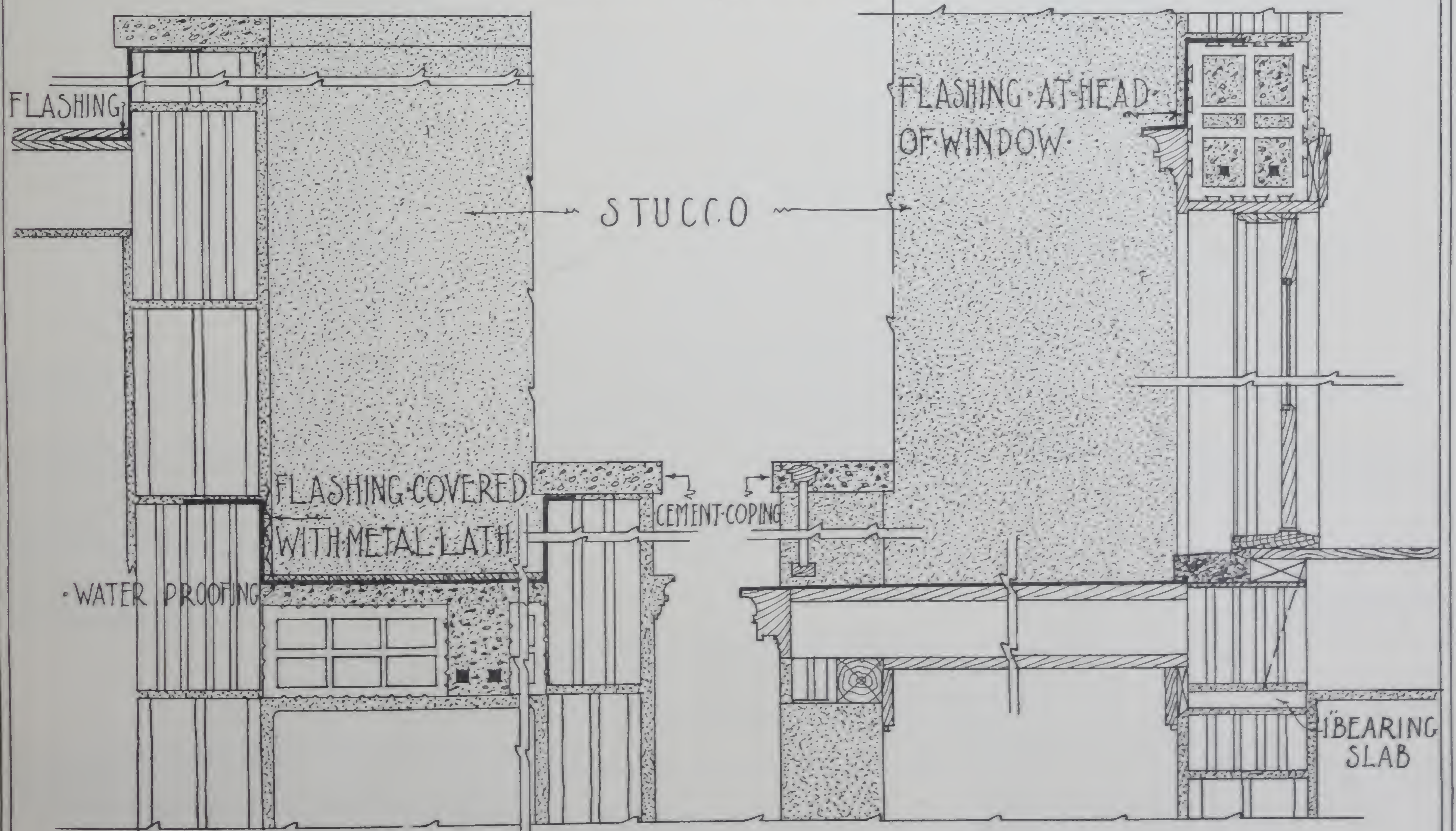
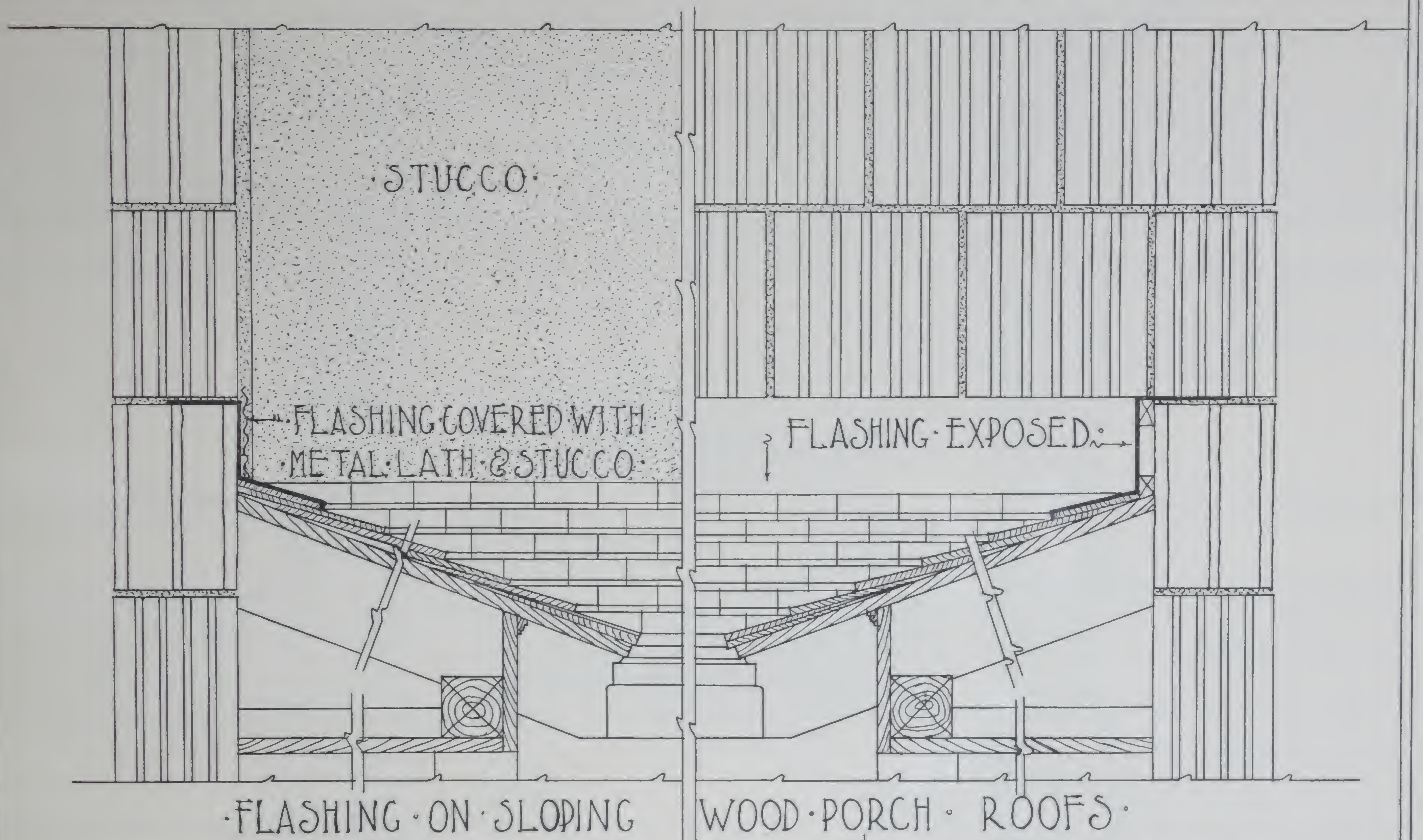
SELF-CLINCHING NAIL USED  
USED FOR NAILING INTO TILE

FURRING STRIPS  
FOR FORM





DETAILS SHOWING METHODS OF FLASHING NATCO TILE WALLS

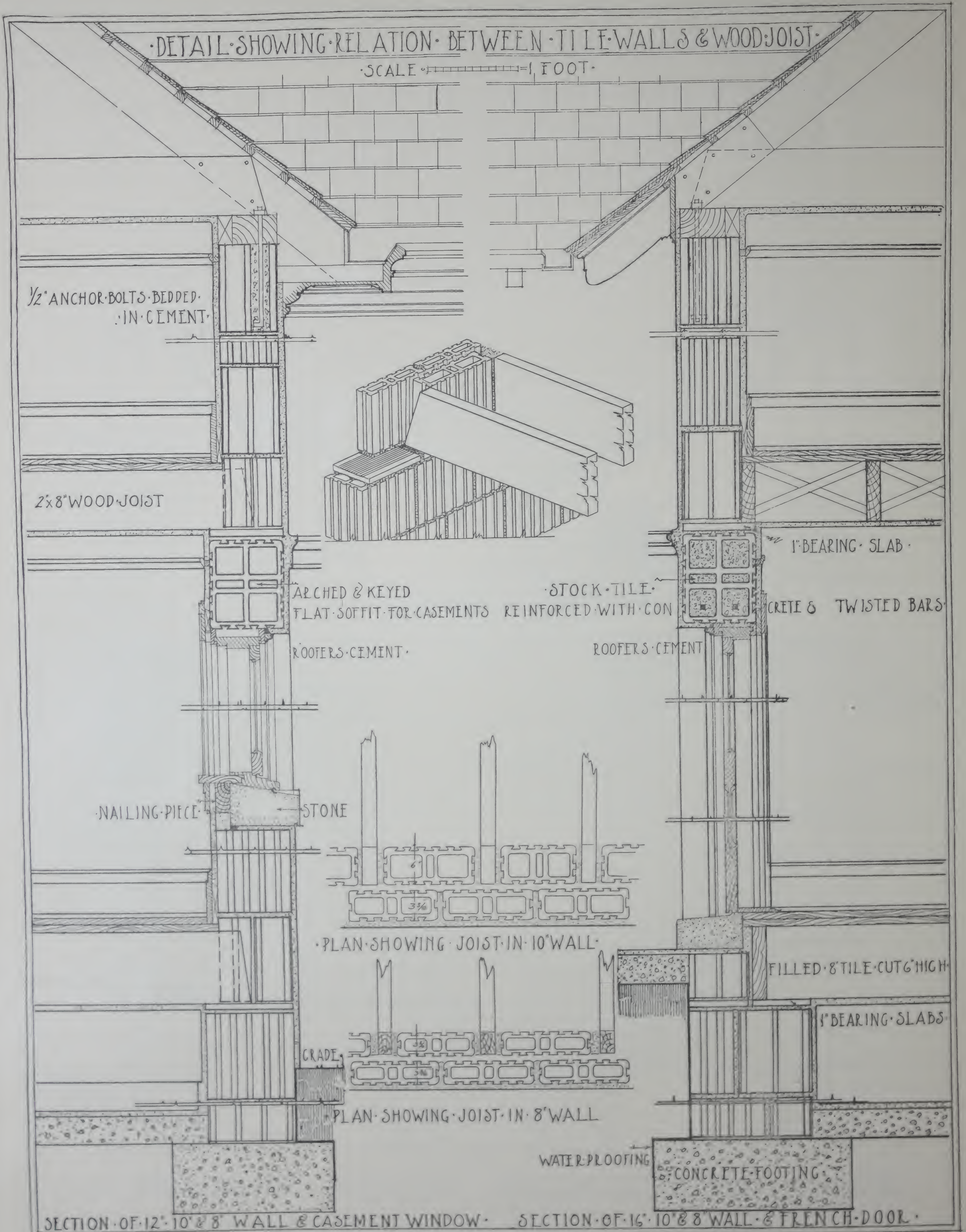


METHOD OF FLASHING FIREPROOF PORCH ROOF

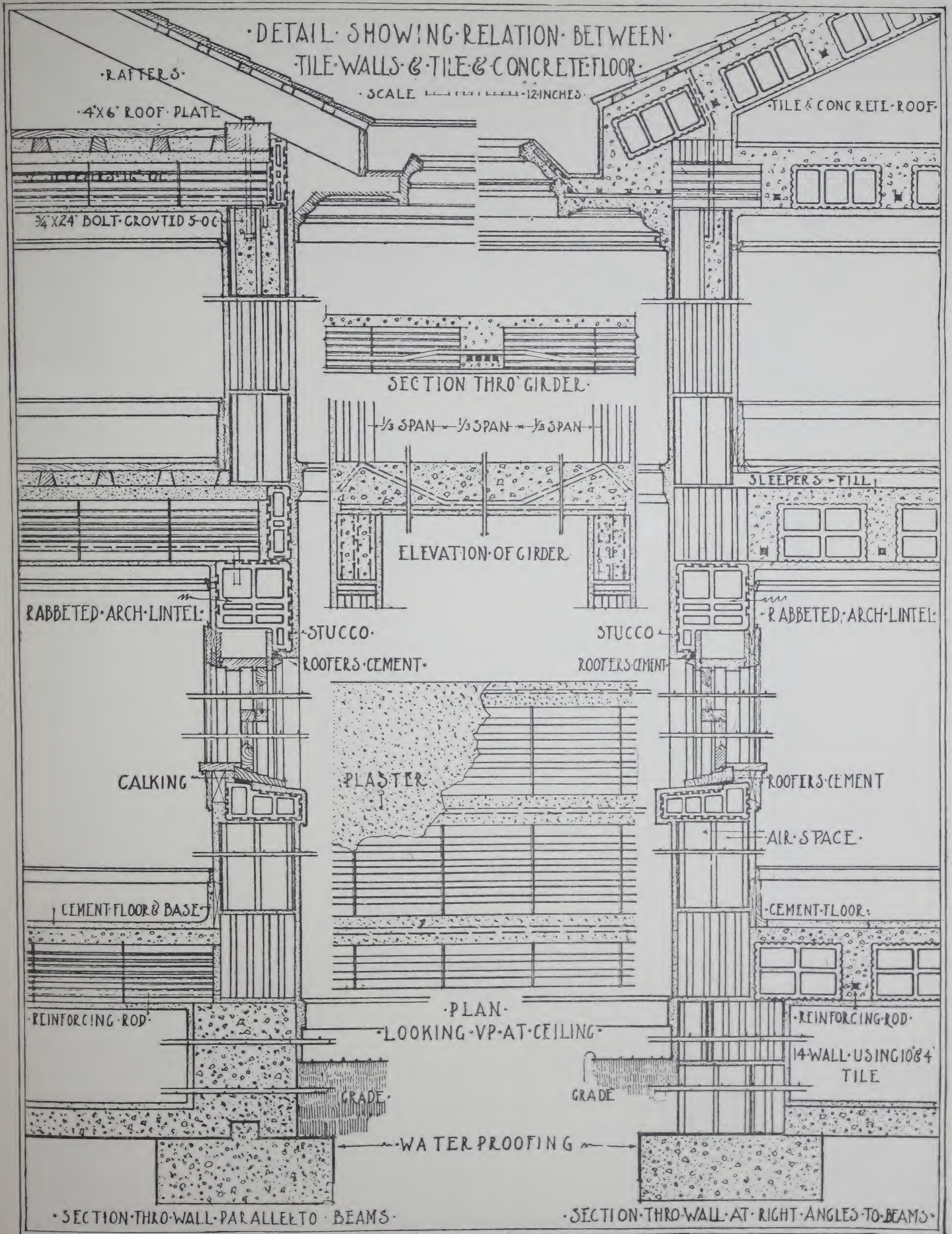
TIN DECK ON FLAT WOOD ROOF



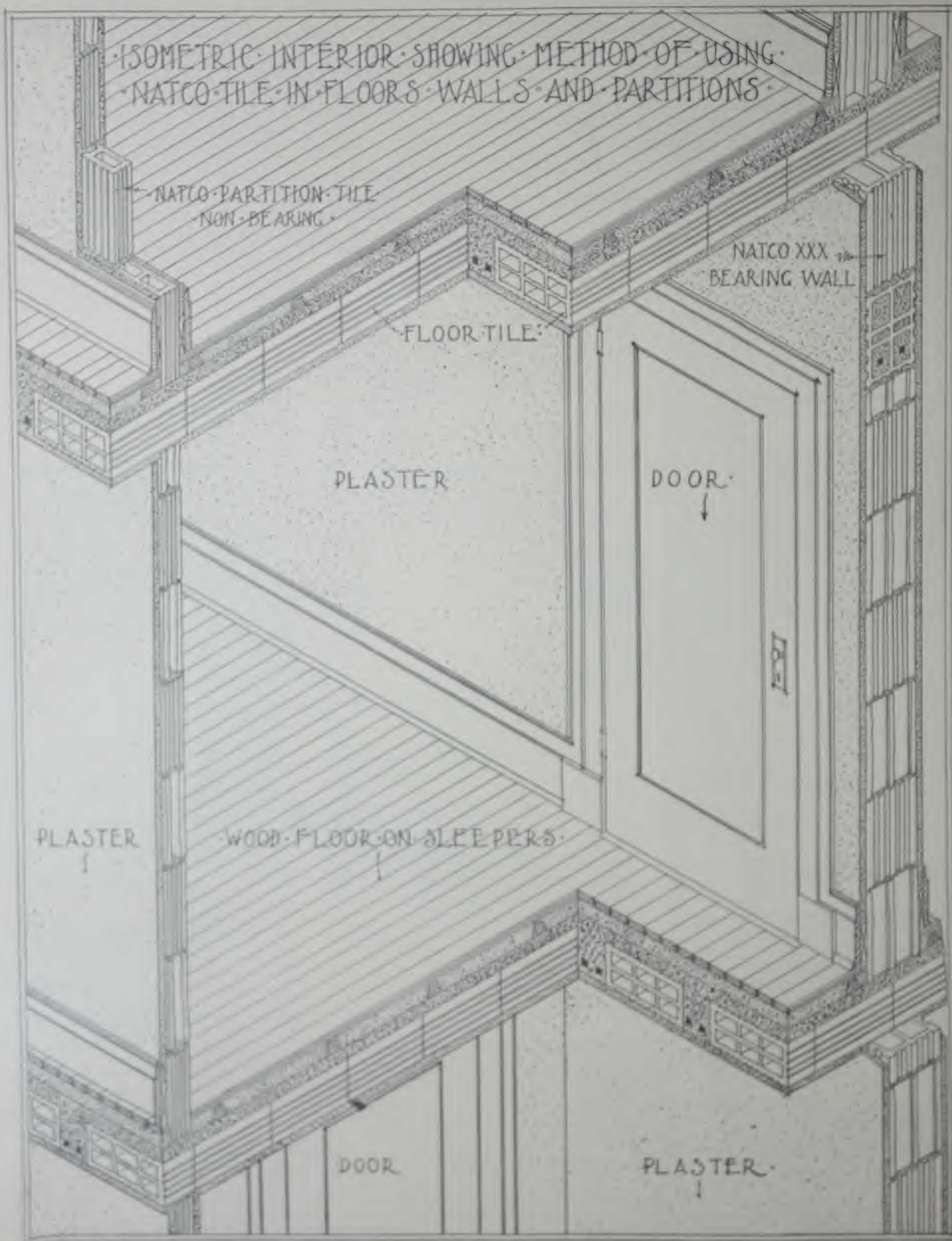
# NATIONAL FIRE PROOFING COMPANY





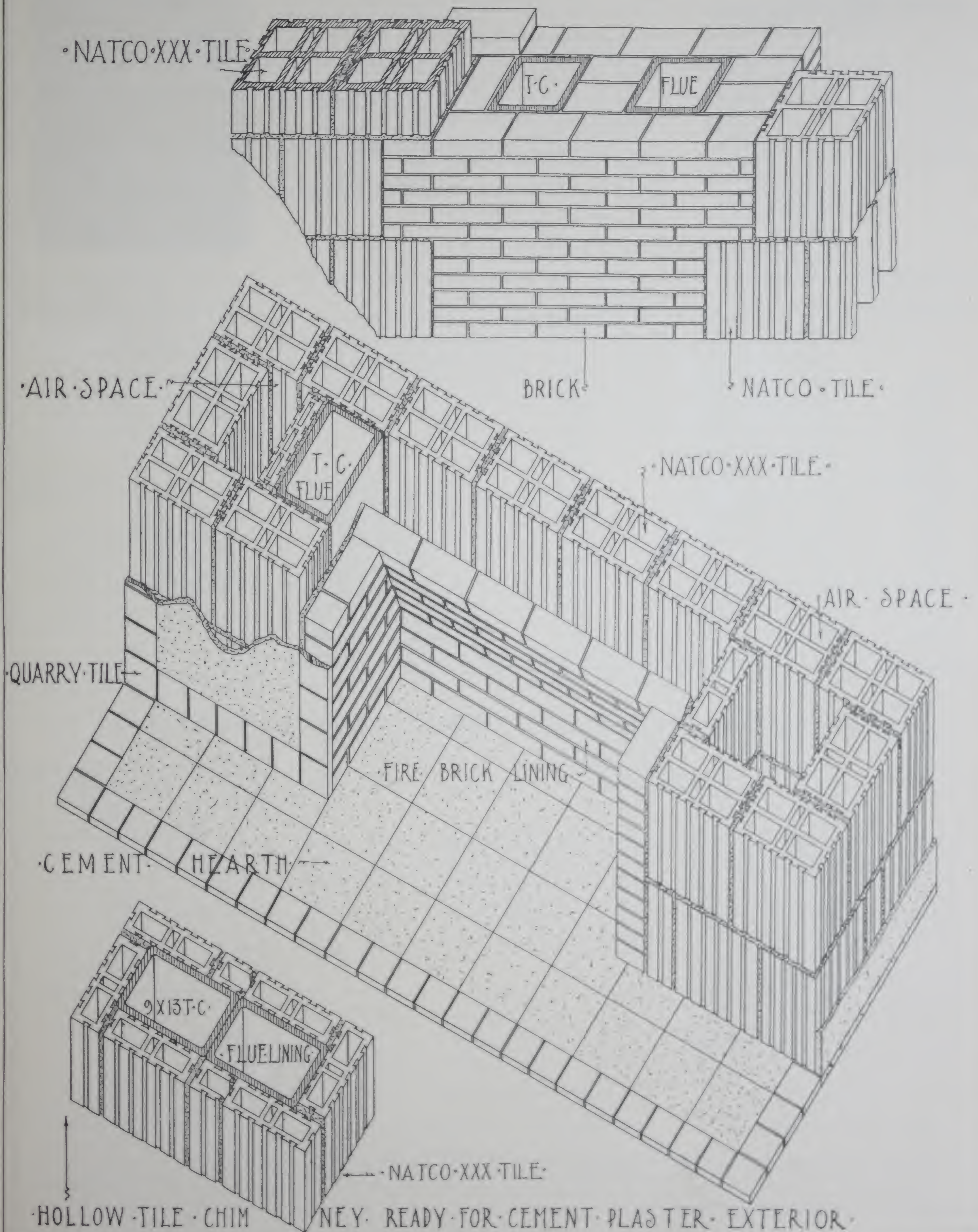




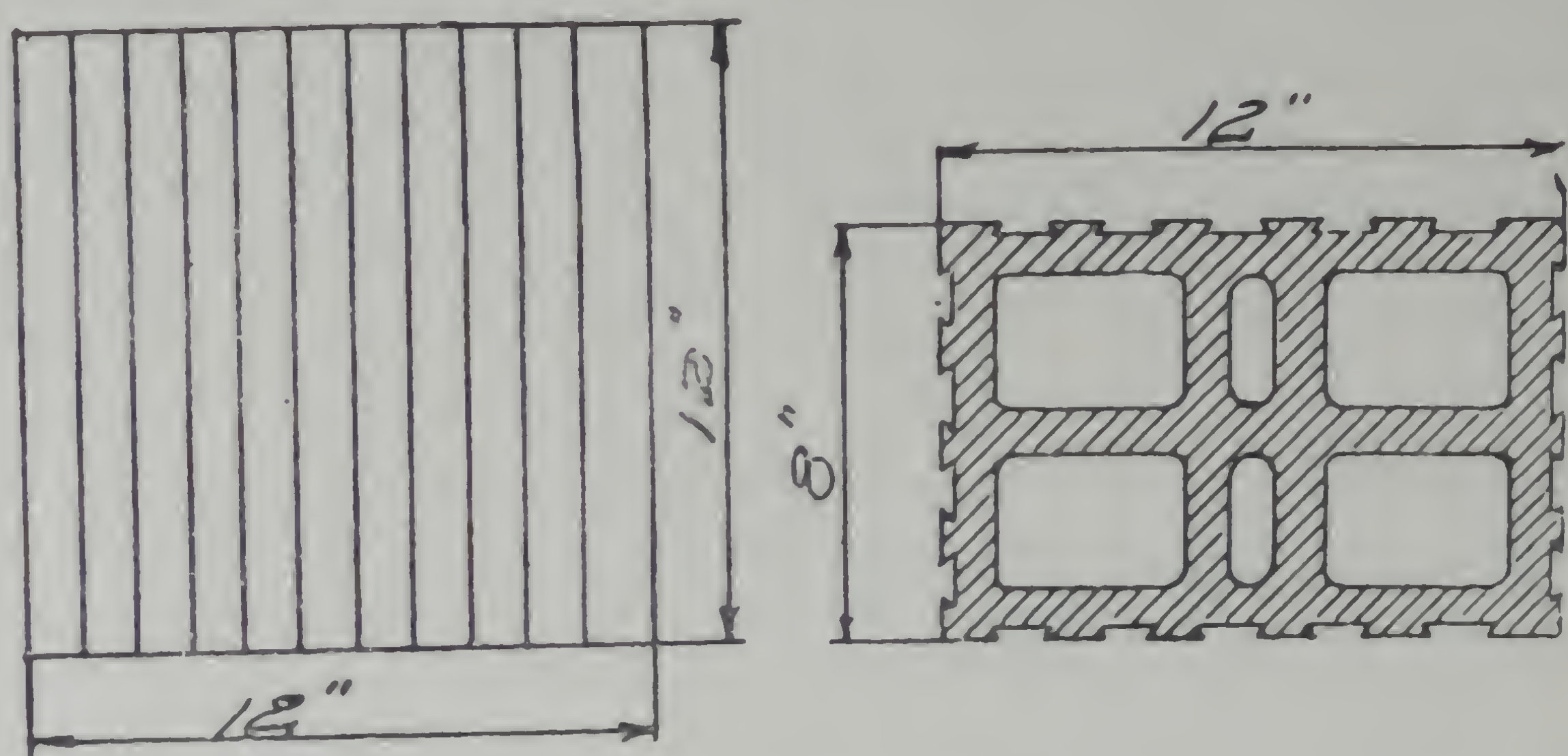
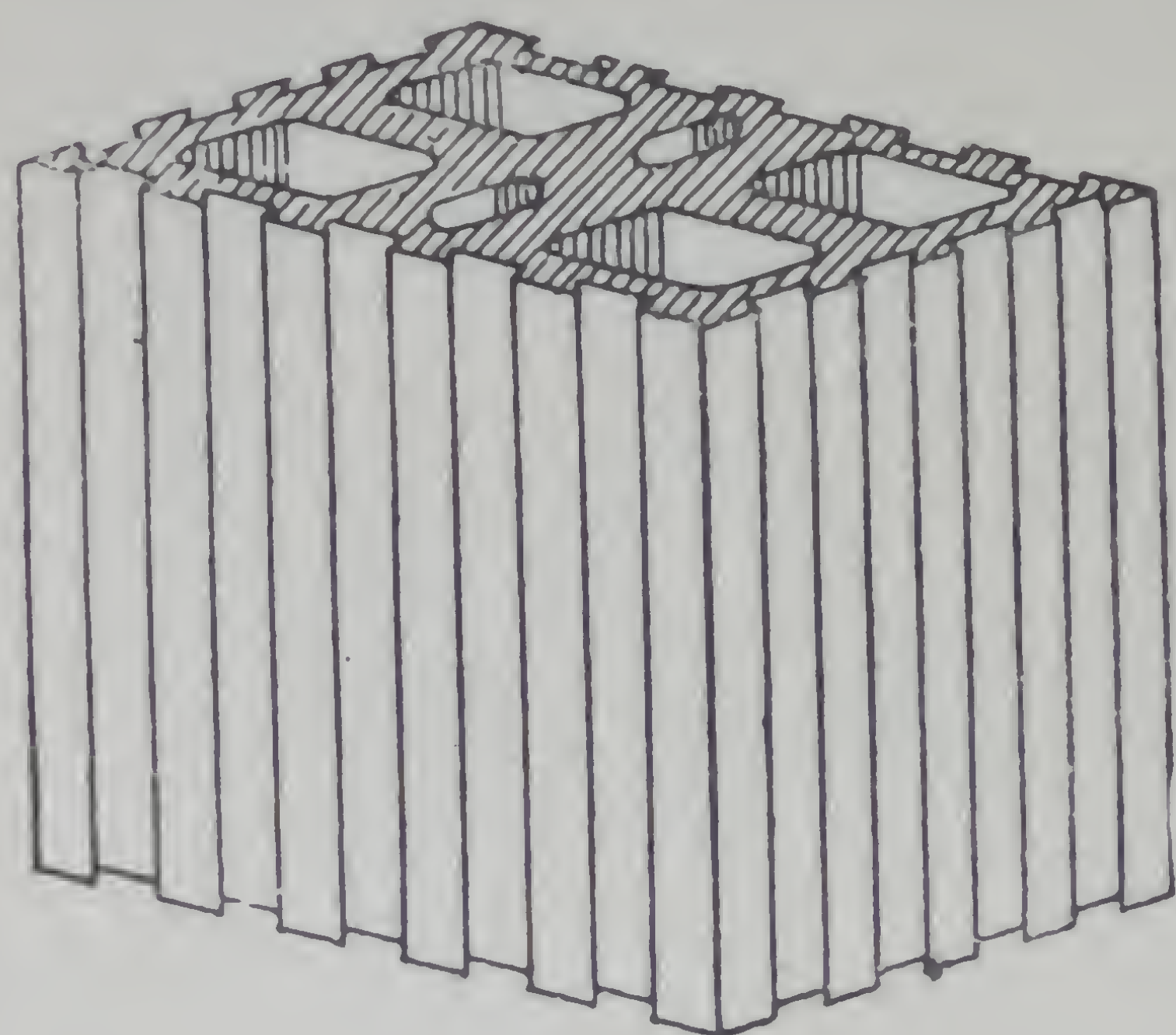




• METHOD • OF • BONDING • BRICK • PIER • OR • CHIMNEY • IN • TILE • WALLS •







TEST OF INDIVIDUAL NATCO XXX TILE

AREA IN COMPRESSION 45.56 SQ. IN. NET AREA OR 96 SQ. IN. GROSS AREA

| Time P. M. | Gauge Reading<br>in Tons<br>2000 Lbs. | Actual Load<br>on Tile<br>Lbs. | Actual Load in Lbs. per Sq. In.<br>on Net Area of<br>Tile in Compression | Remarks                   |
|------------|---------------------------------------|--------------------------------|--|---------------------------|
|            | 1.25                                  | 0                              | 0  |                           |
| 3:09       | 5                                     | 7500                           | 165  |                           |
| 3:26½      | 10                                    | 17500                          | 384  |                           |
| 3:28½      | 20                                    | 37500                          | 823  |                           |
| 3:30½      | 30                                    | 57500                          | 1262   |                           |
| 3:32½      | 40                                    | 77500                          | 1701   |                           |
| 3:34½      | 50                                    | 97500                          | 2140   |                           |
| 3:39½      | 60                                    | 117500                         | 2579   |                           |
| 3:44½      | 70                                    | 137500                         | 3018   |                           |
| 3:47       | 75                                    | 147500                         | 3238   | Very Slight Sound         |
| 3:49½      | 80                                    | 157500                         | 3457   | No Sounds                 |
| 3:52       | 85                                    | 167500                         | 3677   | No Sounds                 |
| 3:54½      | 90                                    | 177500                         | 3896   | Very Slight Sound         |
| 3:57       | 95                                    | 187500                         | 4116   | Distinct Sound            |
| 3:59½      | 100                                   | 197500                         | 4335   | Slight Sounds             |
| 4:02       | 105                                   | 207500                         | 4555   | Continual Slight Sounds   |
| 4:04½      | 110                                   | 217500                         | 4774   | Continual Slight Sounds   |
| 4:07       | 115                                   | 227500                         | 4994   | Continual Cracking Sounds |
| 4:09½      | 120                                   | 237500                         | 5213   | Failure by Crushing       |

This tile was tested to prove the enormous strength of tile set on end to carry loads. Obviously the strength of a wall also depends upon the strength of the mortar used and the care with which the tile are set.

The table below gives the crushing strength of walls built of various kinds of tile and tested in different laboratories.

Built May 6, 1914. Ends trued up with Portland Cement Mortar. Failed at 237,500 lbs. by crushing. Tested May 18, 1914

STRENGTH OF TILE WALLS—TESTS COMPILED FROM VARIOUS SOURCES

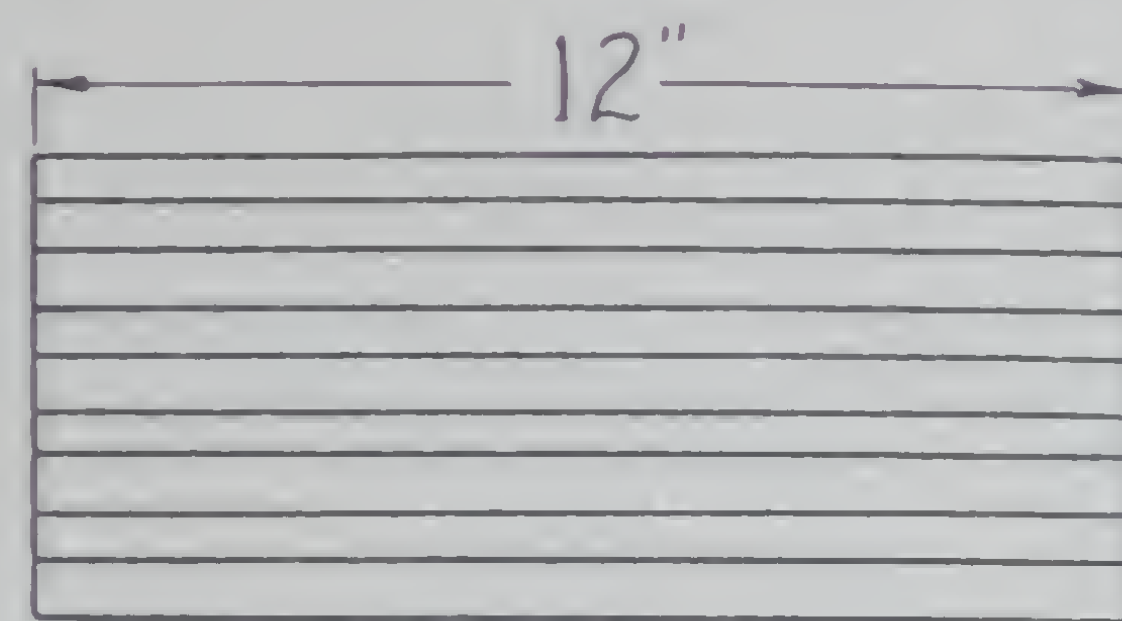
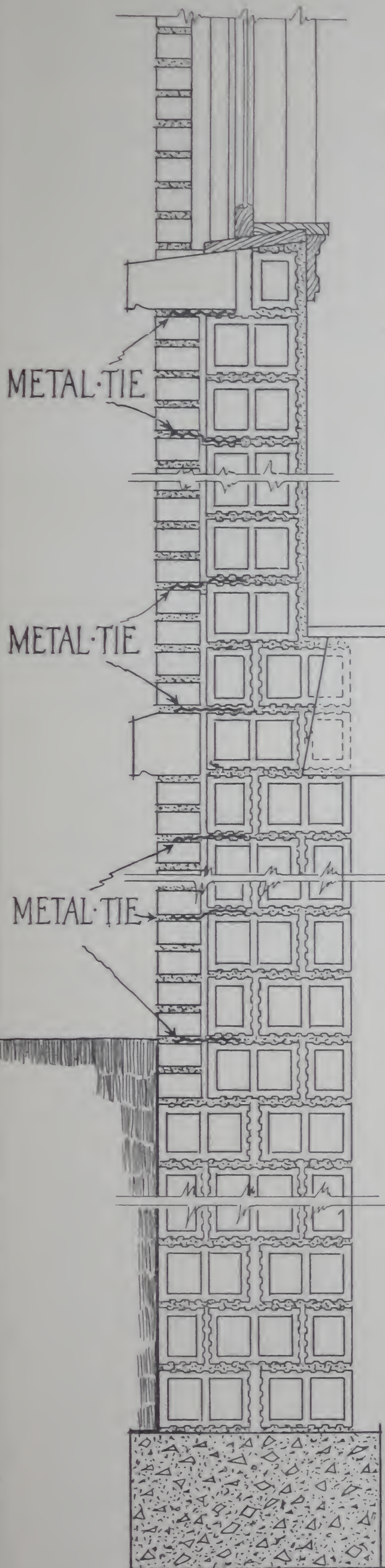
| Remarks                            | Mortar<br>Cement<br>Sand<br>Lime | Size of Wall     | Age<br>Days | Wall<br>Gross<br>Strength<br>Lbs. per<br>Sq. In. | Single Tile<br>Gross<br>Strength<br>Lbs. per<br>Sq. In. | Testing Laboratory                    |
|------------------------------------|----------------------------------|------------------|-------------|--|---|---------------------------------------|
| 8"x12"x 8" Natco XXX—Test on End   | 1-3-0                            | 8"x36½"x12'0"    | 26          | 1680   |   | Robert W. Hunt & Co.                  |
| 8"x12"x 8" Natco XXX—Test on End   | 1-3-0                            | 8"x37 "x12'1"    | 25          | 1135   |   | "                                     |
| 8"x12"x 8" Natco XXX—Test on End   | 1-3-0                            | 8"x37 "x12'1"    | 47          | 1265   |   | "                                     |
| 8"x12"x12" Natco XXX—Test on End   | 1-4-1                            | 8"x36½"x12'2"    | 28          | 1500   | 2475  | "                                     |
| 8"x12"x12" Natco XX—Test on End    | 1-3                              | 8"x35 "x12'4"    | 28          | 570  |   | "                                     |
| 8"x12"x12" Natco XX—Test on End    | 1-3                              | 8"x36½"x12'6"    | 33          | 1220   |   | "                                     |
| 8"x12"x12" Natco XX—Test on Side   | 1-3                              | 8"x37 "x12'4"    | 28          | 280  |   | "                                     |
| 8"x12"x12" Natco XX—Test on Side   | 1-3-1                            | 8"x33 "x12'0"    | 99          | 330  |   | "                                     |
| Walls 4'0"x12'0". Mortar joints ⅜" |                                  |                  |             |  |   |                                       |
| 12"x12"x12" Natco XXX—Test on End  | 1-3-¼                            | 12"x4'0"x12'0"   | 28-32       | 934  | 2855*   | U. S. Bureau of Standards, Pittsburgh |
| 6"x12"x12" Natco XXX Test on End   | 1-3-¼                            | 6"x4'0"x12'0"    | 28-32       | 1020   | 4000*   | "                                     |
| 8"x12"x12" Natco XXX—Test on End   | 1-3-¼                            | 8"x4'0"x12'0"    | 28-32       | 1040   | 2310*   | "                                     |
| 12"x12"x12" Natco XXX—Test on End  | 1-3-¼                            | 12"x4'0"x12'0"   | 28-32       | 940  | 1675†   | "                                     |
| 6"x12"x12" Natco XXX—Test on End   | 1-3-¼                            | 6"x4'0"x12'0"    | 28-32       | 713  | 1900†   | "                                     |
| 6"x12"x12" Natco XXX—Test on Side  | 1-3-¼                            | 6"x4'0"x12'0"    | 28-32       | 385  | 585†  | "                                     |
| Toronto brick—average quality      | 1-3-25%                          | 8½"x 8½"x9'0"    | 105         | 550  |   | Toronto University                    |
| Natco 8"x5"x12" Backup             | 1-3-10%                          | 8" x 5'4"x 9'10" | 18          | 290  |   | U. S. Bureau of Std.                  |

NOTE:—The results given for \* tile are the averages of three tests for both walls and individual tile.  
The results given for † tile are the averages of two tests of walls and those of individual tile.  
These walls were built by experienced brick layers accustomed to this class of work. The proportions of mortar materials are given in bulk measurements and not weight.

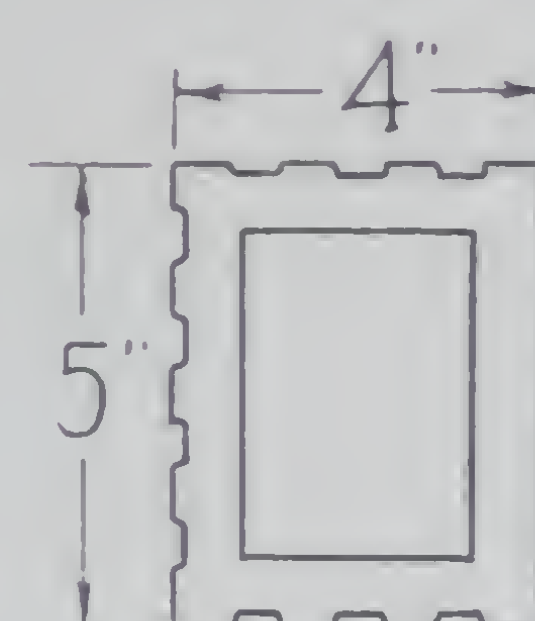


# • DETAIL OF NATCO BAKUP TILE WITH BRICK VENEER •

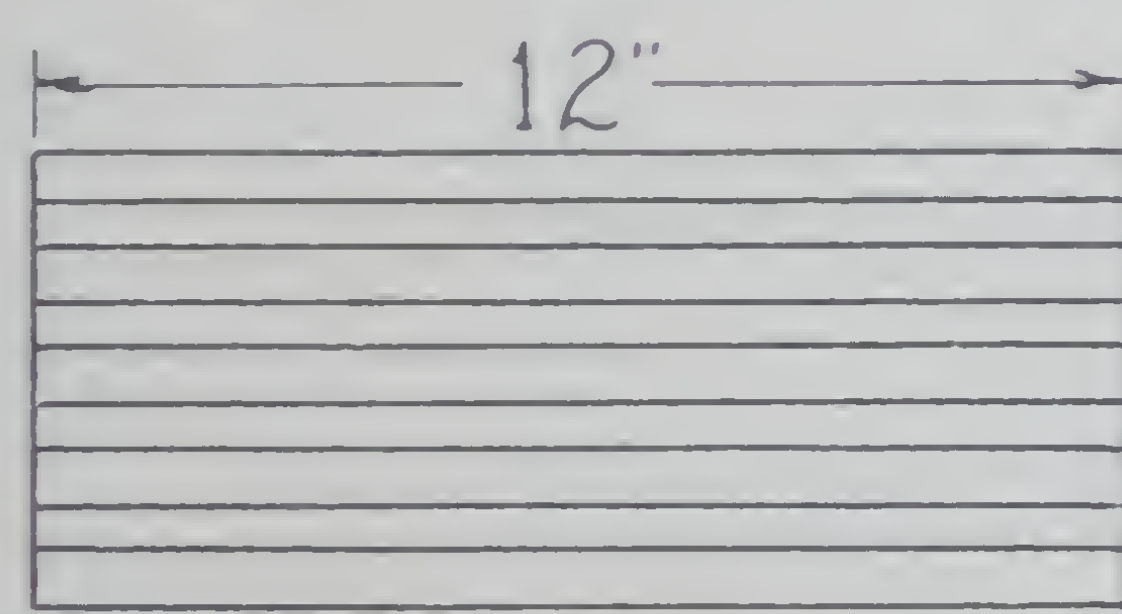
• NATCO BAKUP TILE ARE MADE •  
 • IN TWO SIZES 5"X8"X12" AND 5"X4"X12" •  
 • CORNER TILE FURNISHED FOR •  
 • BOTH SIZES •



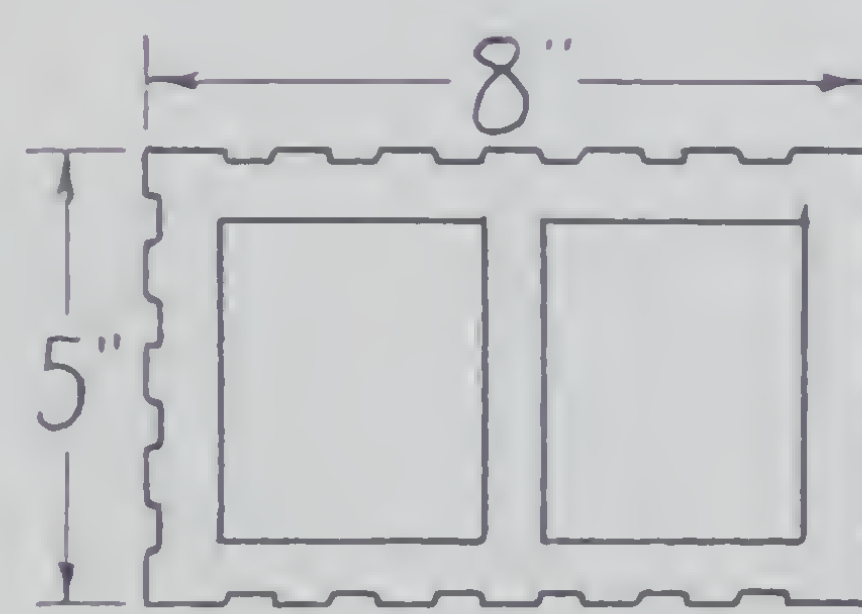
• SIDE VIEW •



• END VIEW •

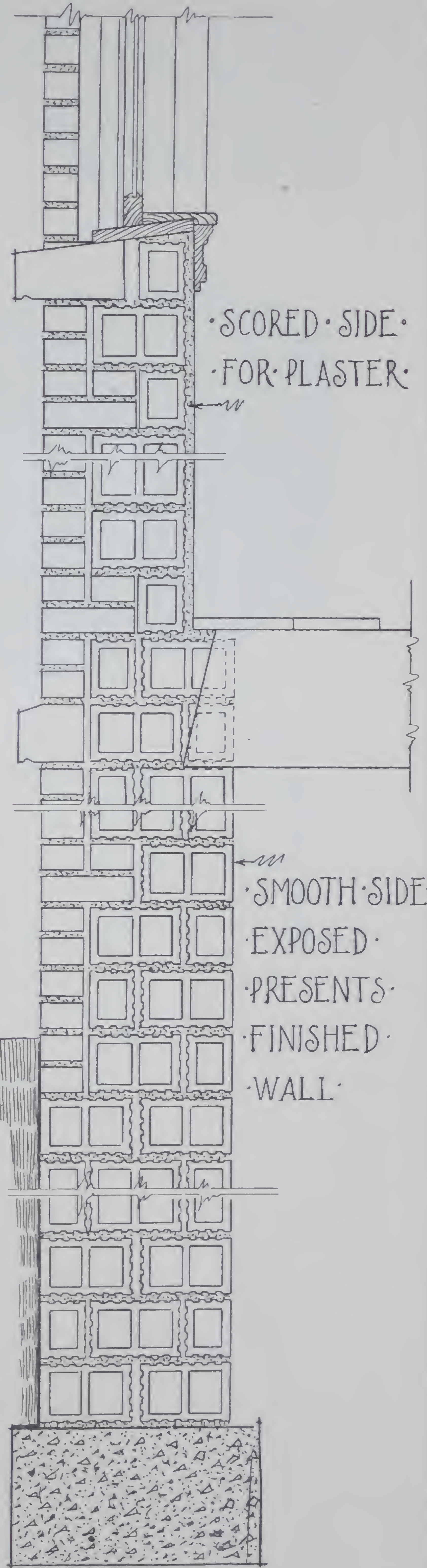


• SIDE VIEW •



• END VIEW •

• ALL NATCO BAKUP TILE ARE SCORED •  
 • 3 SIDES AND SMOOTH ON ONE 5"X12" •  
 • FACE SO THAT A SMOOTH WALL •  
 • INSIDE OR OUT MAY BE HAD IF DESIRED •



• SCORED SIDE •  
 • FOR PLASTER •

• SMOOTH SIDE •  
 • EXPOSED •  
 • PRESENTS •  
 • FINISHED •  
 • WALL •

• SECTION OF WALL SHOWING BRICK VENEER •  
 • SECURED WITH METAL TIES •

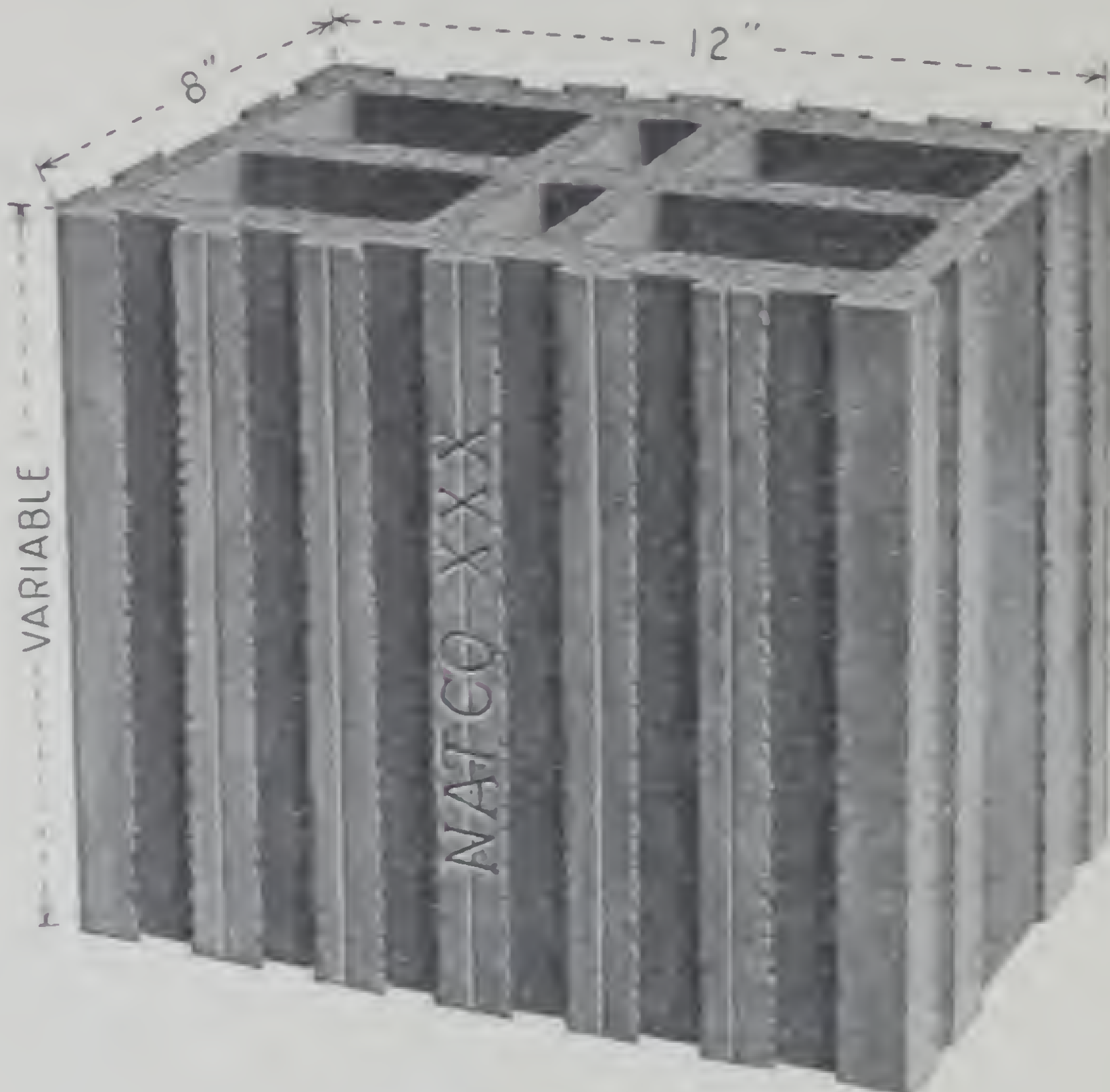
• SECTION OF WALL SHOWING BRICK VENEER •  
 • BONDED WITH BRICK HEADERS •



## Natco Header Backer Tile



Natco Header Tile

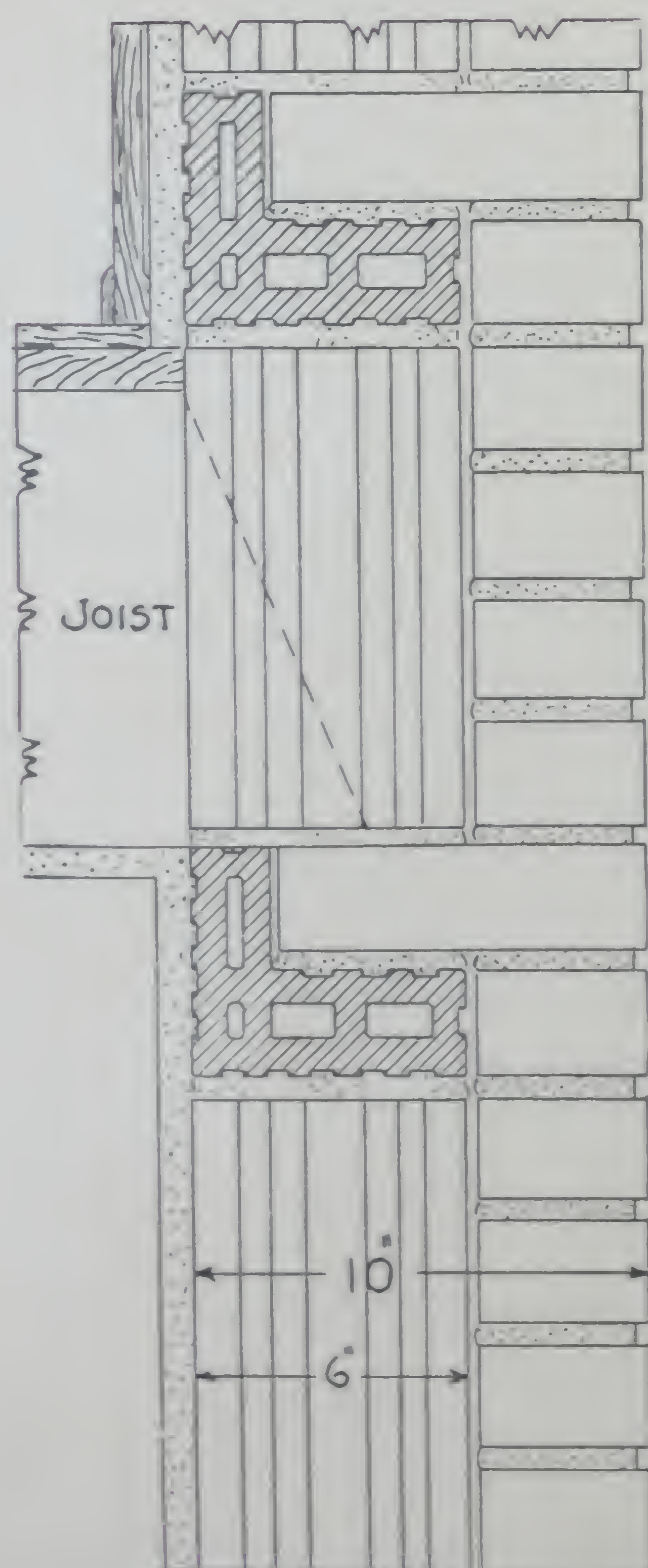


Natco Backer Tile

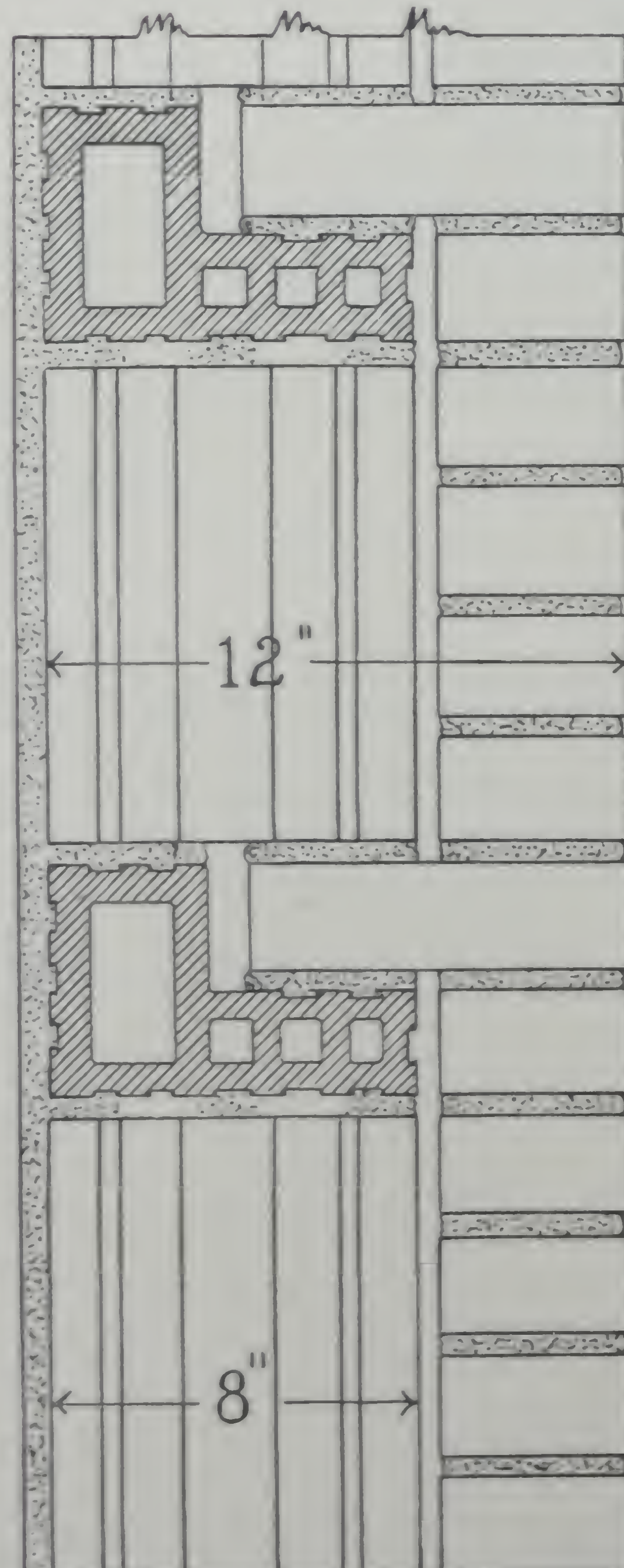
**W**ALLS of Natco Header Backer Tile in combination with brick or stone, are mechanically bonded, light in weight, substantial and permanent. Their use in commercial and industrial buildings has become a standard construction.

For enclosure walls in steel or reinforced concrete skeleton buildings, Natco Header Backer walls are the ideal in point of economy. The facing of face brick, stone, or other material, and the backing of Natco Header Backer Tile work in unison to carry the load. No cutting or use of slabs is required. A saving of 25 per cent in labor and mortar is effected in the walls themselves. A lighter structural frame, made possible by a 25 per cent reduction in dead weight, further decreases costs considerably.

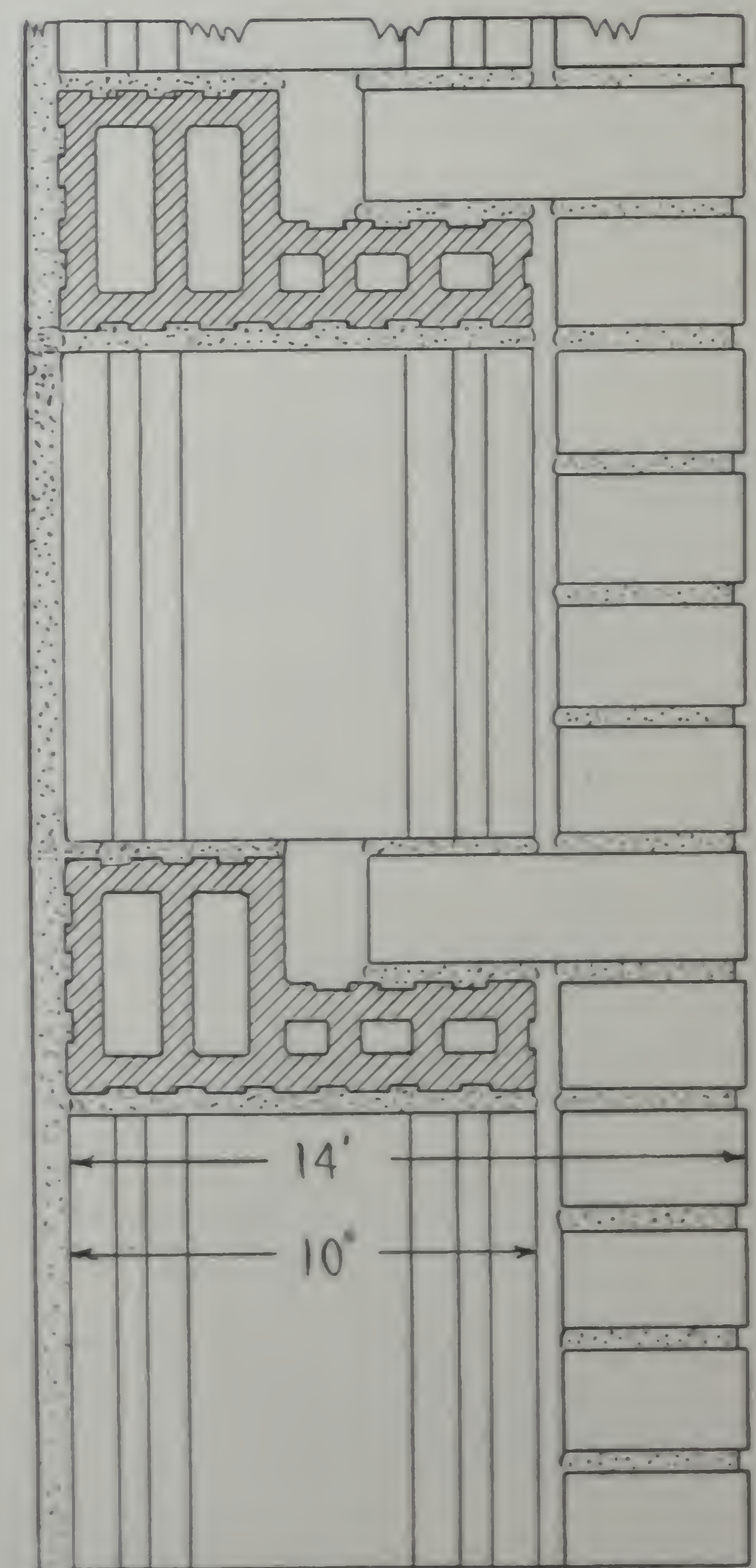
The Natco Header is a tile designed especially for bonding the header courses of face brick to the tile backing. The Natco Backer is a rectangular tile for backing the stretcher courses of brick and is cut to various heights for proper bonding with different thicknesses of face brick and mortar joints. With the standard brick of  $2\frac{1}{4}$  in. thickness, laid up with  $\frac{1}{2}$  in. bed joints, a Backer tile  $10\frac{1}{2}$  in. high is required and this is the most common usage. When bonded the Natco Header Backer way, full bearing value for the entire thickness of the wall is allowed. Where metal wall ties are used instead of a header bond, the brick facing acts only as a veneer, so cannot be figured to carry any load, and in time is likely to crack and fall away from the backing material.



Typical section of 10-inch wall showing joist bearing



Typical Section of 12-inch wall



Typical section of 14-inch wall



By the use of Natco Header Backer construction, a dry insulated wall is assured as there are no mortar joints extending through the wall. Thus cold, heat and moisture cannot penetrate. The interior tile surface is scored and forms an ideal base for plastering.

Below are sections of 10-inch, 12-inch, 14-inch, and 16-inch walls. You can just as readily build 20-inch, 24-inch, or thicker walls, with the use of additional tile.

One 8 x 5 x 12 in. Natco Header Tile and one 8 x 12 x 10½ in. Natco Backer Tile, including ½ in. bed and vertical joints, lay up 1.43 sq. ft. of wall surface, or conversely, there are required 700 Head-

ers and 700 Backers to lay up 1000 sq. ft. of wall surface.

### *Special 8" Wall Construction*

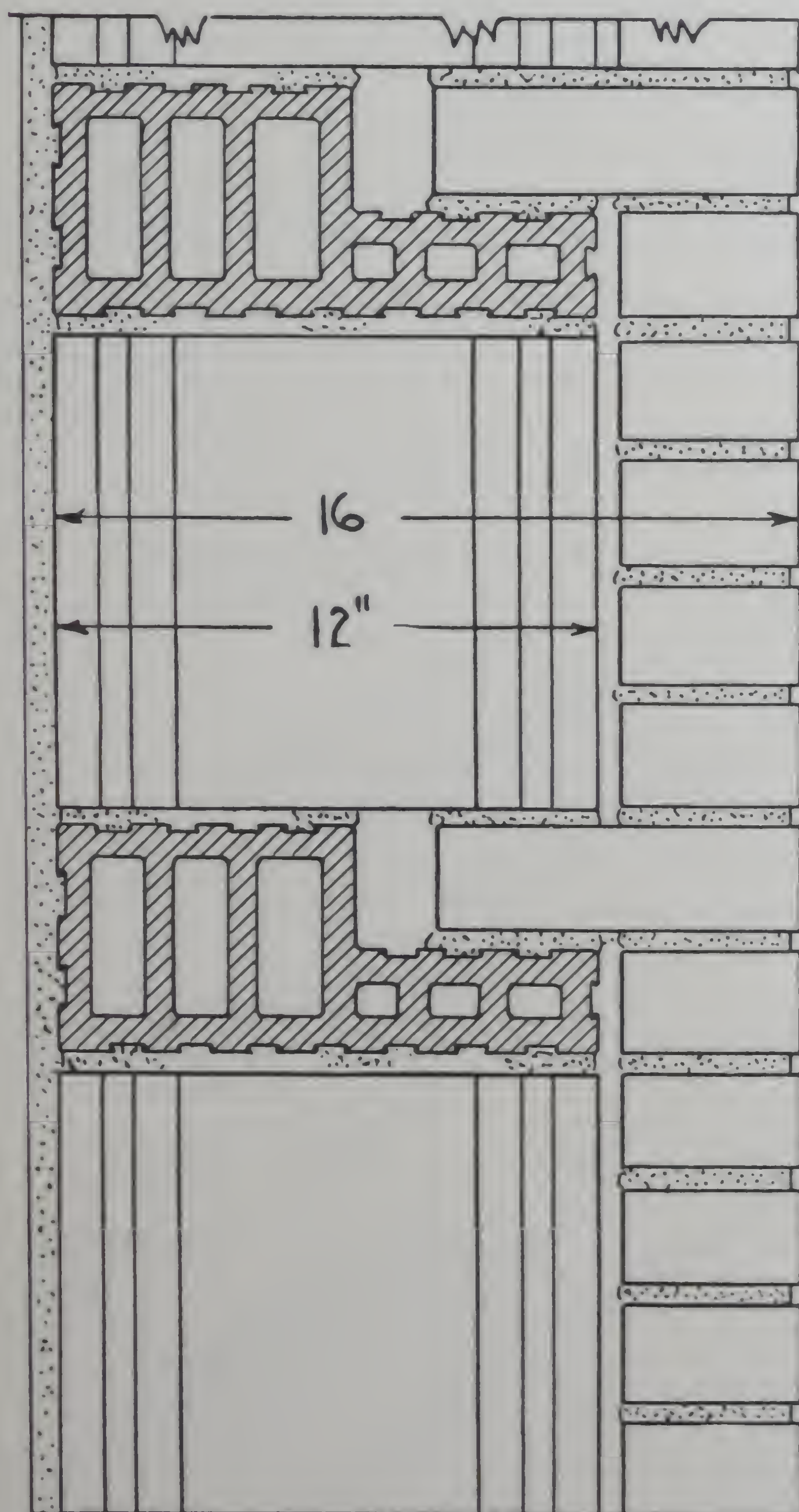
For residences we can supply 4x12x10½ Tile to be faced with 4 inches of brick and when bonded with headers every fifth course, makes a satisfactory 8 in. masonry wall. Details will be furnished on application.

Our Estimating Department is at your service at all times. If you will write us, we shall be glad to figure on any plans or blue prints you send us and shall give you the cost of the quantities of Natco Hollow Tile which you will need for any type of building delivered at your nearest railroad station.

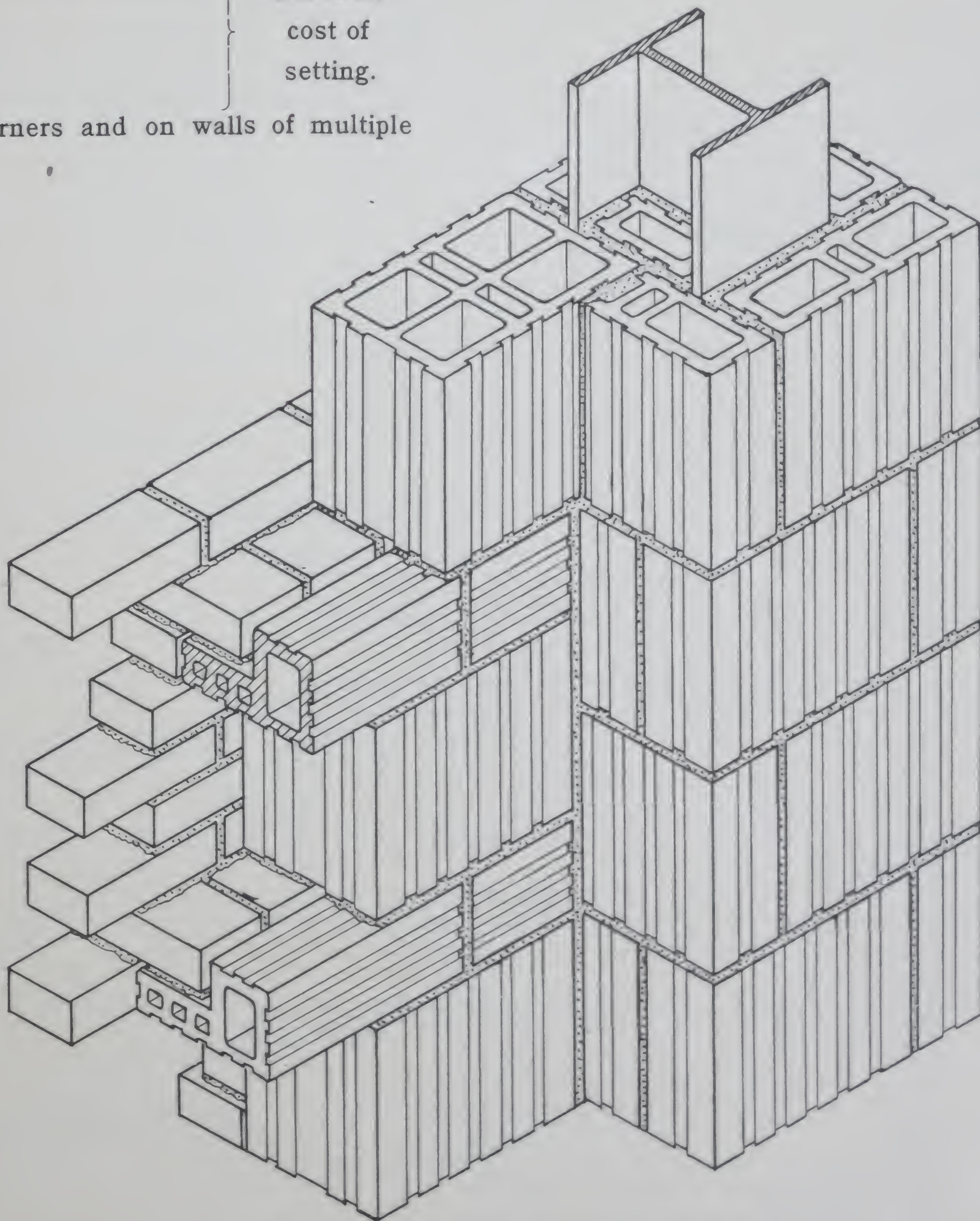
## *Advantages*

1. Ability to work to any story height without cutting or use of slabs.
2. Full bearing for floor joists.
3. Decreased dead loads compared to brick backing.
4. Made in suitable heights to afford proper bonding.
5. No through mortar joints—therefore no moisture penetration, eliminating necessity of furring.
6. Minimum number of units to handle.
7. Saving in mortar.
8. Rapidity of construction.
9. Simplicity of construction at jambs and corners and on walls of multiple thickness.

Reduced  
cost of  
setting.



Typical section of 16-inch wall



Bonding of Column Covering and wall

THE STANDARD HEIGHT BACKER IS 10½" AND THE HEADER 5", BUT AS NOTED ABOVE THIS CAN BE VARIABLE



# NATCO DOUBLE-SHELL TILE

## GENERAL DATA AND LOAD TESTS

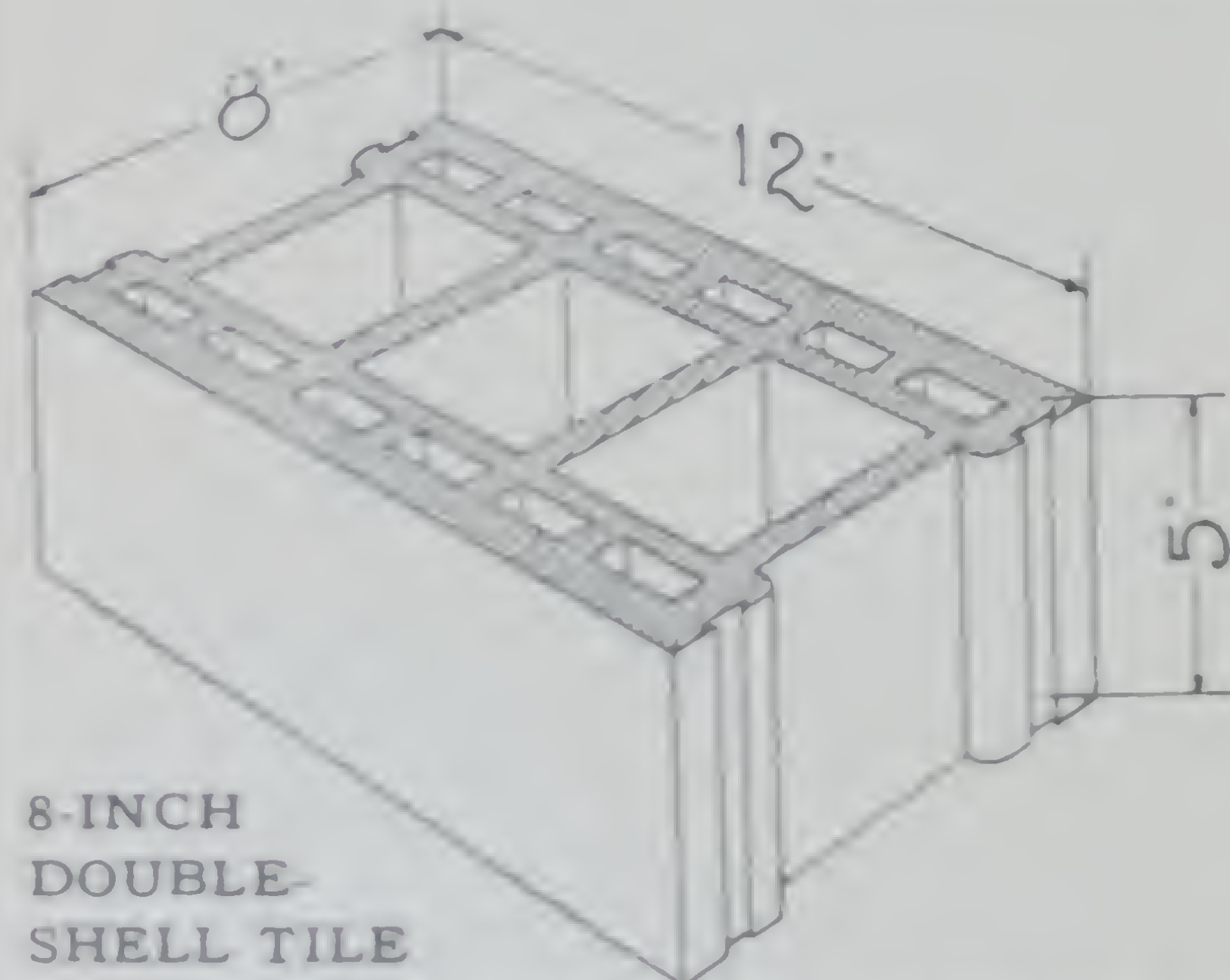
As indicated in the name of this improved NATCO product, the interior and exterior "bed" or horizontal mortar joints are spread on double shells of sufficient width to insure a well bonded wall of maximum strength. The "head" or vertical joints are spread on the edges of the ends of each tile so as to leave an air space in these joints. The recess or moisture-stop at both ends of the regular wall-tile further assures the obtaining of this air space. No attempt should be made to spread mortar on the cross webs. Strict adherence to these details will avoid through mortar joints which are almost invariably conductors of moisture and cold, a frequent source of trouble with other types of construction.

The general instructions for mortar, laying, etc., given for NATCO XXX apply with equal force to the handling of all NATCO Hollow Tile. The following, however, are points that should be kept in mind when designing or erecting with this face-tile.

1. SIZES, 6" x 12" x 5"—for walls 6 inches thick.  
8" x 12" x 5"—for walls 8 inches thick.
2. TYPES, GLAZED—One scratched face 12" x 5" and one smooth face 12" x 5", giving an exterior finish similar to a rough face brick and a smooth impervious interior.  
UNGLAZED—Two scratched faces 12" x 5", giving a choice of two faces for an exterior finished surface similar to a rough face brick and an interior scratched surface rough enough for the application of ordinary plaster directly to the hollow tile surface.
3. UNITS. In designing buildings or when laying out foundation or other walls, it should be borne in mind that this face-tile is made in 12-inch and 5 $\frac{3}{4}$ -inch lengths, and the length of the walls from corner to corner and the width of all openings, should conform to these full and half units
4. The shapes shown on the page opposite and on the following pages are our standard, therefore designers should avoid any "specials" not shown thereon. The preparation of a new die takes considerable time and money, and involves the manufacture of an untried shape. These "standards" have been adopted after long experience and investigation and should meet every building requirement. The advice of our building experts is always at the disposal of the architect, designer, and contractor.
5. Note carefully the location of factories at which the several types of face tile are manufactured; this information is found at the top of each page just below the title.

## COMPRESSION TESTS OF SINGLE UNITS OF DOUBLE SHELL TILE

Conducted by Carnegie Institute of Technology, Pittsburgh, Pa., July, 1918



8-INCH  
DOUBLE-  
SHELL TILE

| Number of Specimen | Nominal Size  | Net Area (Sq. In.) | Maximum Load |                         |
|--------------------|---------------|--------------------|--------------|-------------------------|
|                    |               |                    | Total (Lbs.) | Units (Lbs per Sq. In.) |
| 1                  | 8" x 12" x 5" | 44.25              | 299450       | 6770                    |
| 2                  | 8" x 12" x 5" | 44.25              | 258580       | 5840                    |
| 3                  | 8" x 12" x 5" | 44.25              | 285280       | 6450                    |
| 4                  | 6" x 12" x 5" | 39.75              | 238000       | 5990                    |
| 5                  | 6" x 12" x 5" | 39.75              | 311650       | 7840                    |
| 6                  | 6" x 12" x 5" | 39.75              | 270510       | 6810                    |
| 7                  | 8" x 12" x 5" | 44.25              | 224760       | 5080                    |
| 8                  | 6" x 12" x 5" | 39.75              | 252050       | 6340                    |

NOTE:—Specimens No. 7 and No. 8 were glazed. Specimen No. 7 showed a detail failure at one end due likely to improper bedding which no doubt explains the low result obtained.

All tile were tested on end and were bedded in plaster of paris on top and bottom, the plaster of paris cap extending over the webs so that the full cross-section of the tile was in bearing. The sizes tested were 8" x 12" x 5" and 6" x 12" x 5". The unit loads were based on the net area.

## RESULTS OF COMPRESSION TESTS ON WALL SECTIONS

Conducted by Carnegie Institute of Technology,  
Pittsburgh, Pa., Aug. 27, 1918.

Tests made for BUILDING CODE COMMISSION,  
City of Pittsburgh

Four walls were built and tested at age of 28 days.  
Tile laid on end, as shown, by an experienced bricklayer.  
Mortar joints  $\frac{3}{8}$  of an inch, 1 part cement, 1/10 part hydrated lime, 2 parts sharp sand—by loose volume.  
Mortar specimens 28 days old tested 358 lbs. per sq. in. in tension and 2,900 lbs. per sq. in. in compression; being respectively standard briquettes and cylinders 2 in. in diameter and 4 in. high.

Each wall built on  $\frac{1}{4}$ " steel plate; first course bedded in mortar, and plaster of paris cap placed on top just before loading.  
Tested in 500,000-lb. Olsen Machine; all loads applied at rate of 0.25" per minute.

The following are average results for two 6" walls and two 8" walls tested.:

Dimensions of top course—6" wall; 24 $\frac{3}{4}$ " long by 5 $\frac{1}{2}$ " wide;

Area of top course—145 square inches;

Total maximum load—202,520 pounds;

Unit maximum load—1,400 pounds per square inch gross area of top course.

2,548 pounds per square inch sectional area of tile in top course.

Dimensions of top course—8" wall: 24" long by 7 $\frac{1}{2}$ " wide;

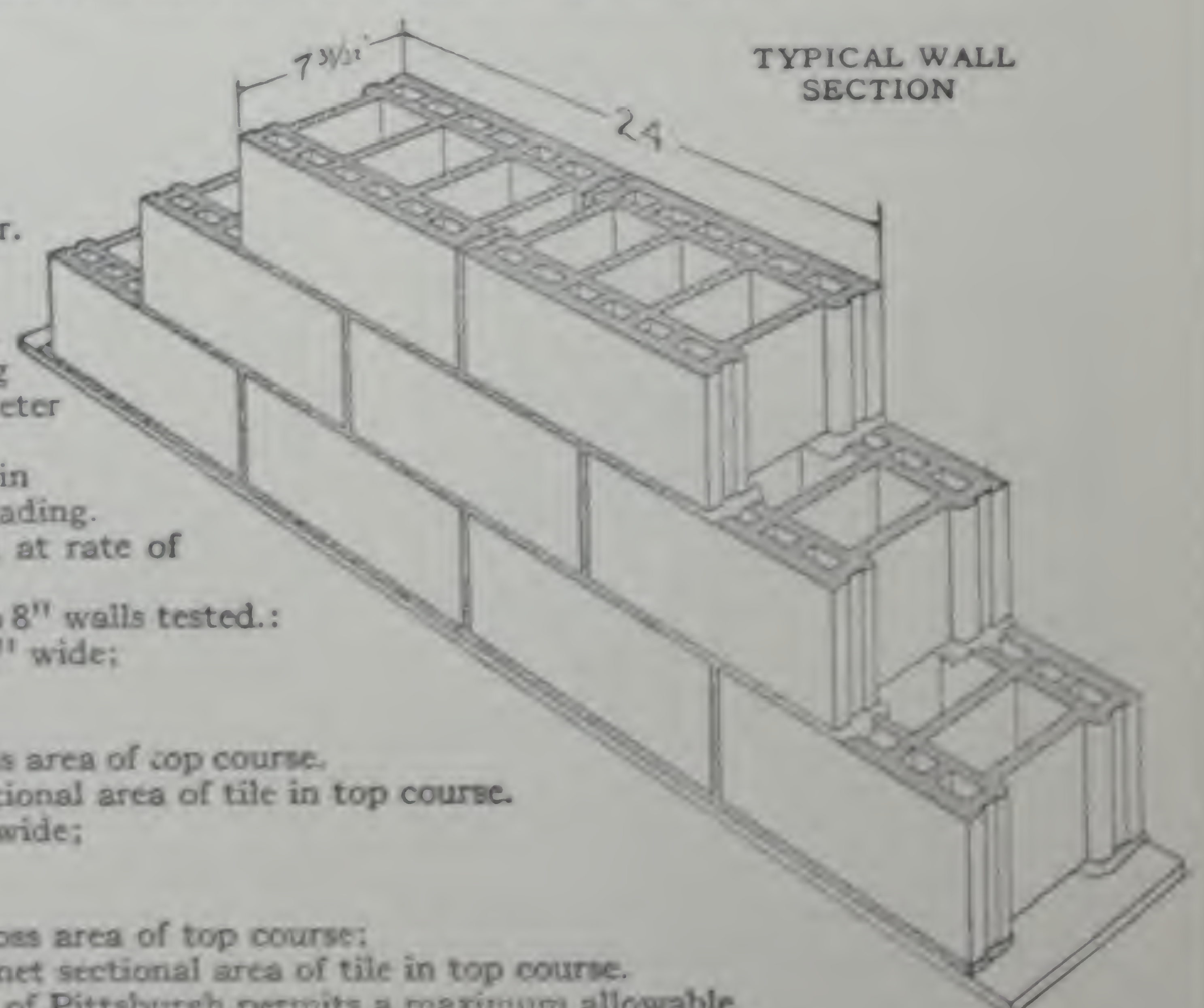
Area of top course—189 square inches;

Total maximum load—206,600 pounds;

Unit maximum load—1,090 pounds per square inch gross area of top course;

2,334 pounds per square inch of net sectional area of tile in top course.

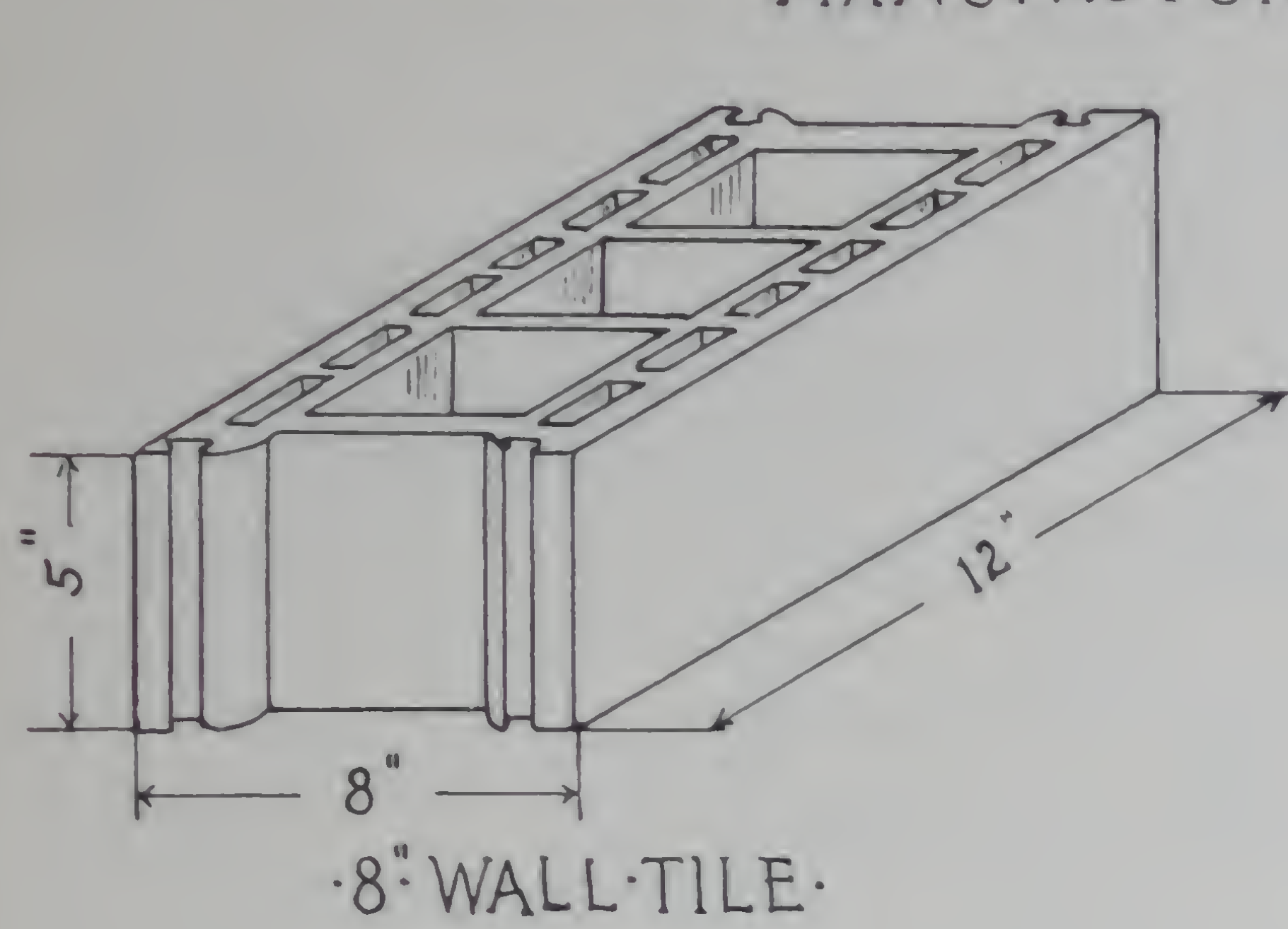
Based on these tests the present Ordinance of the City of Pittsburgh permits a maximum allowable unit working stress of 150 pounds per square inch in compression of the gross sectional area of the bearing walls in which the tile is set with cells vertical in the wall.



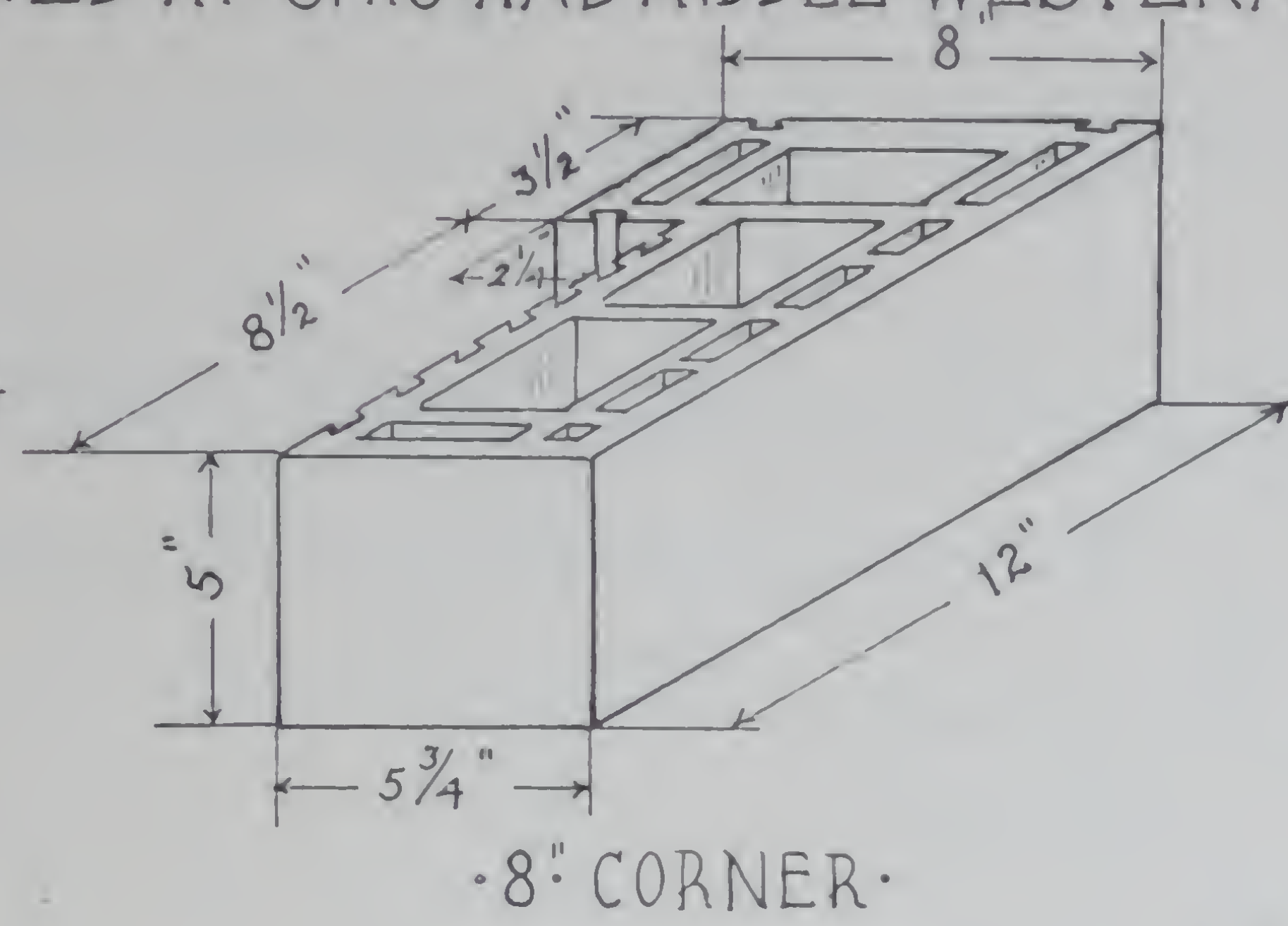
TYPICAL WALL  
SECTION



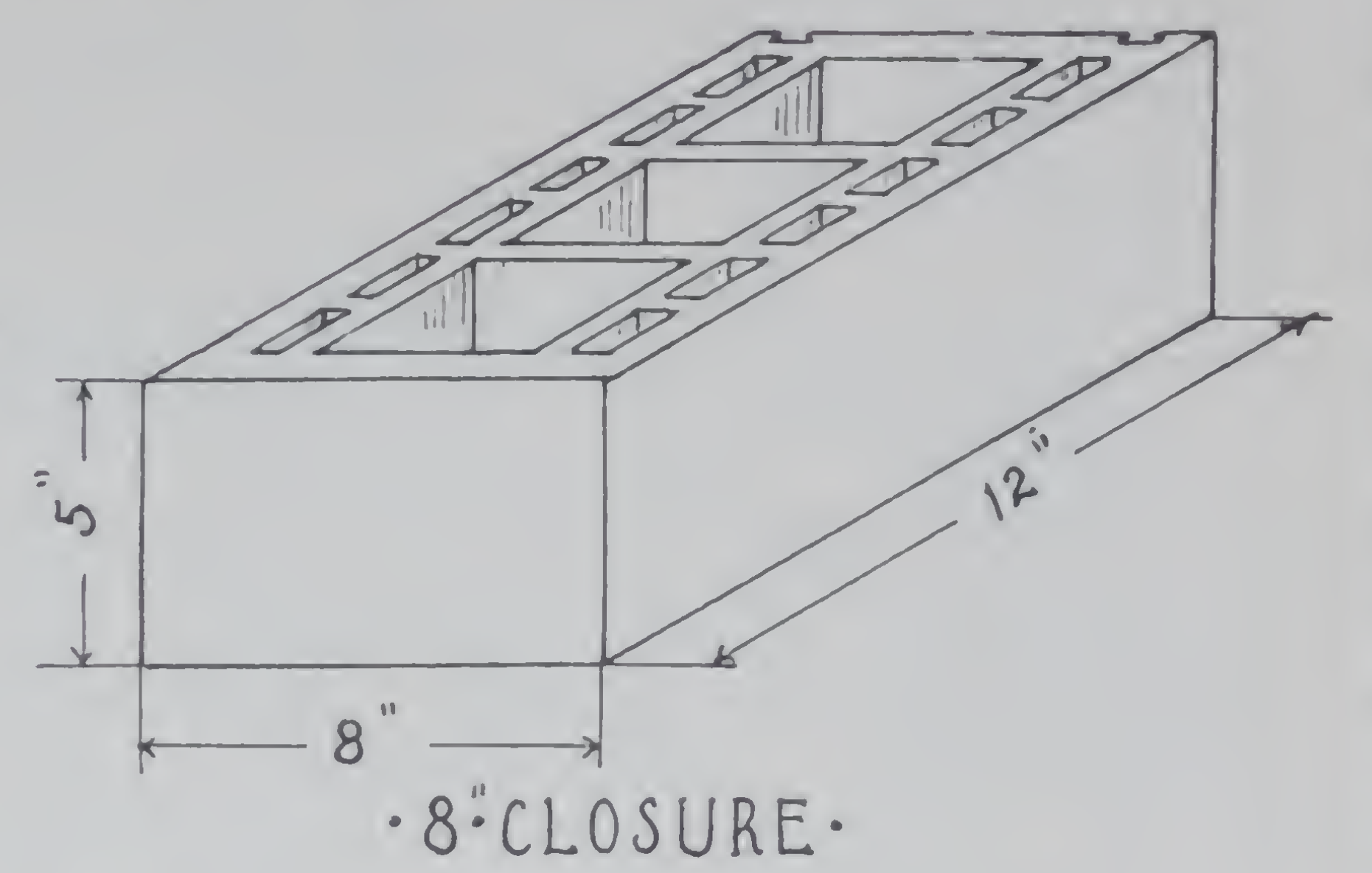
DETAILS OF SHAPES OF 6" AND 8" NATCO DOUBLE SHELL TILE.  
MANUFACTURED AT OHIO AND MIDDLE WESTERN FACTORIES



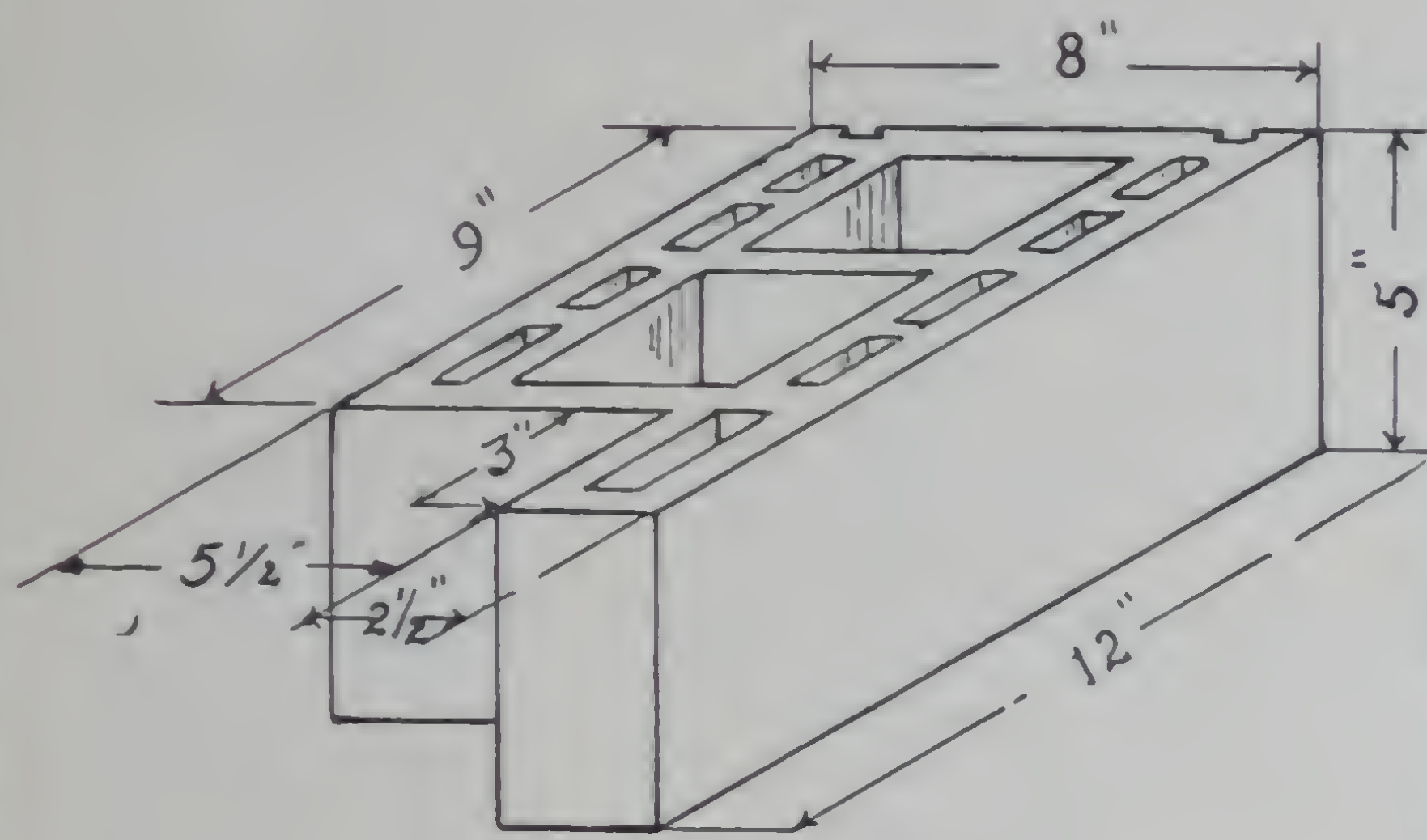
8" WALL TILE



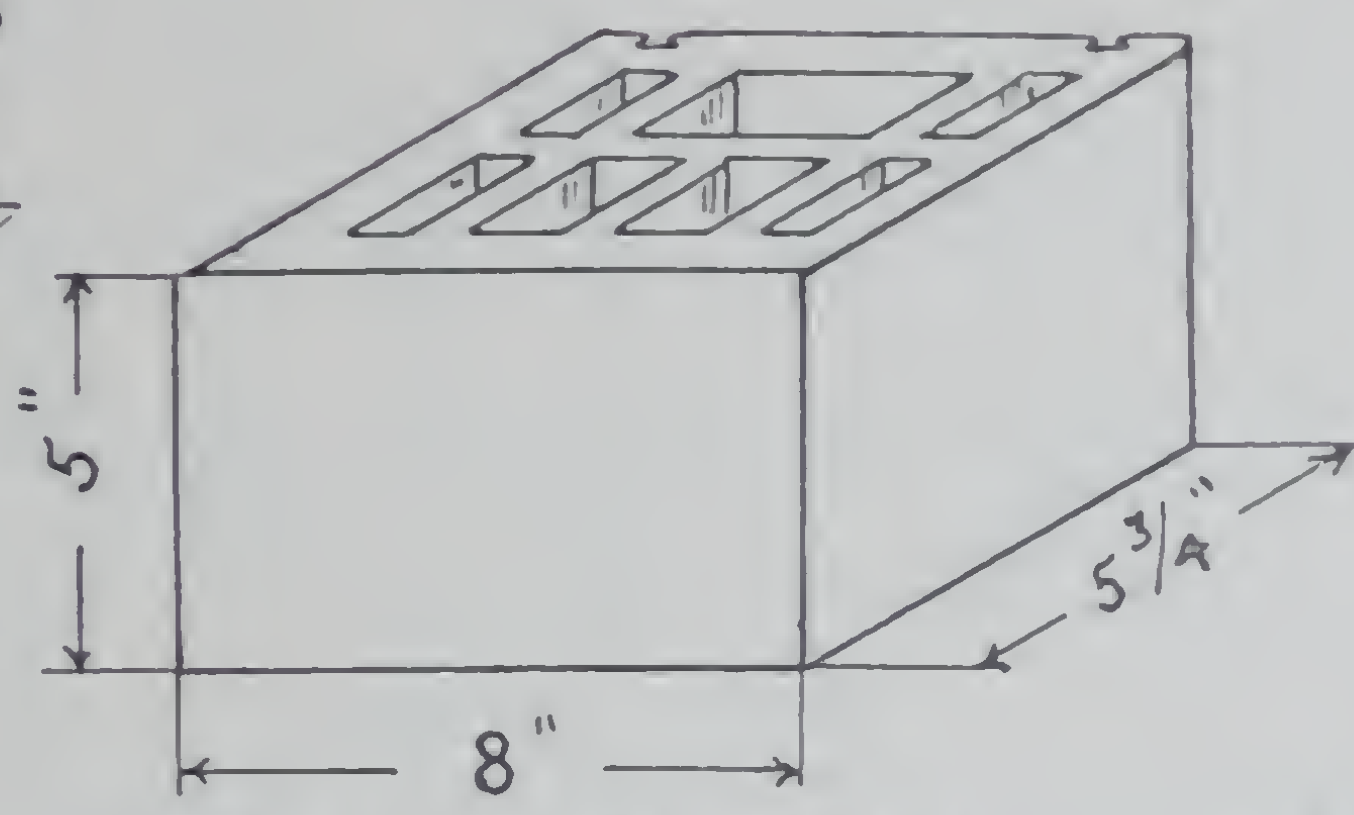
8" CORNER



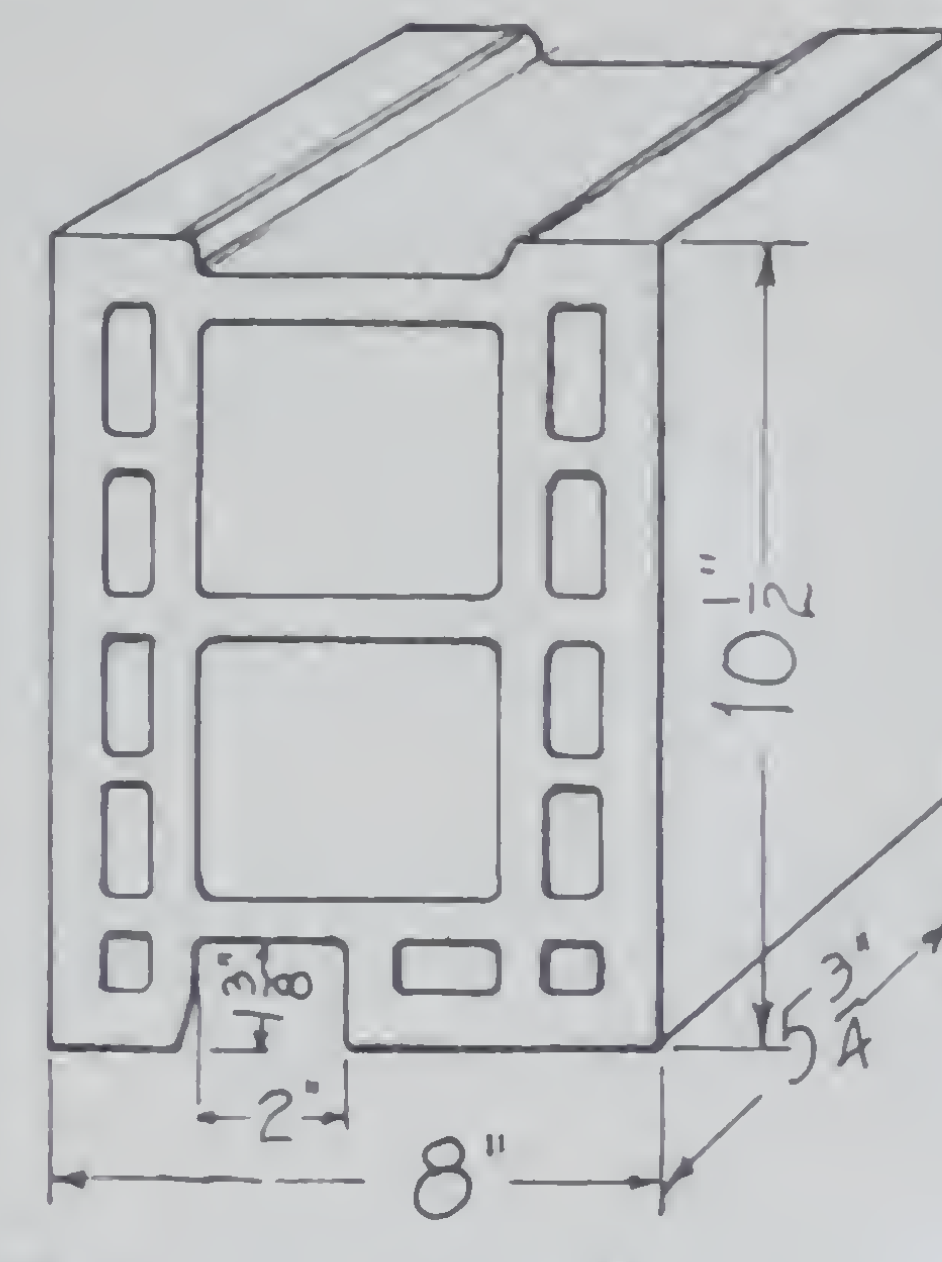
8" CLOSURE



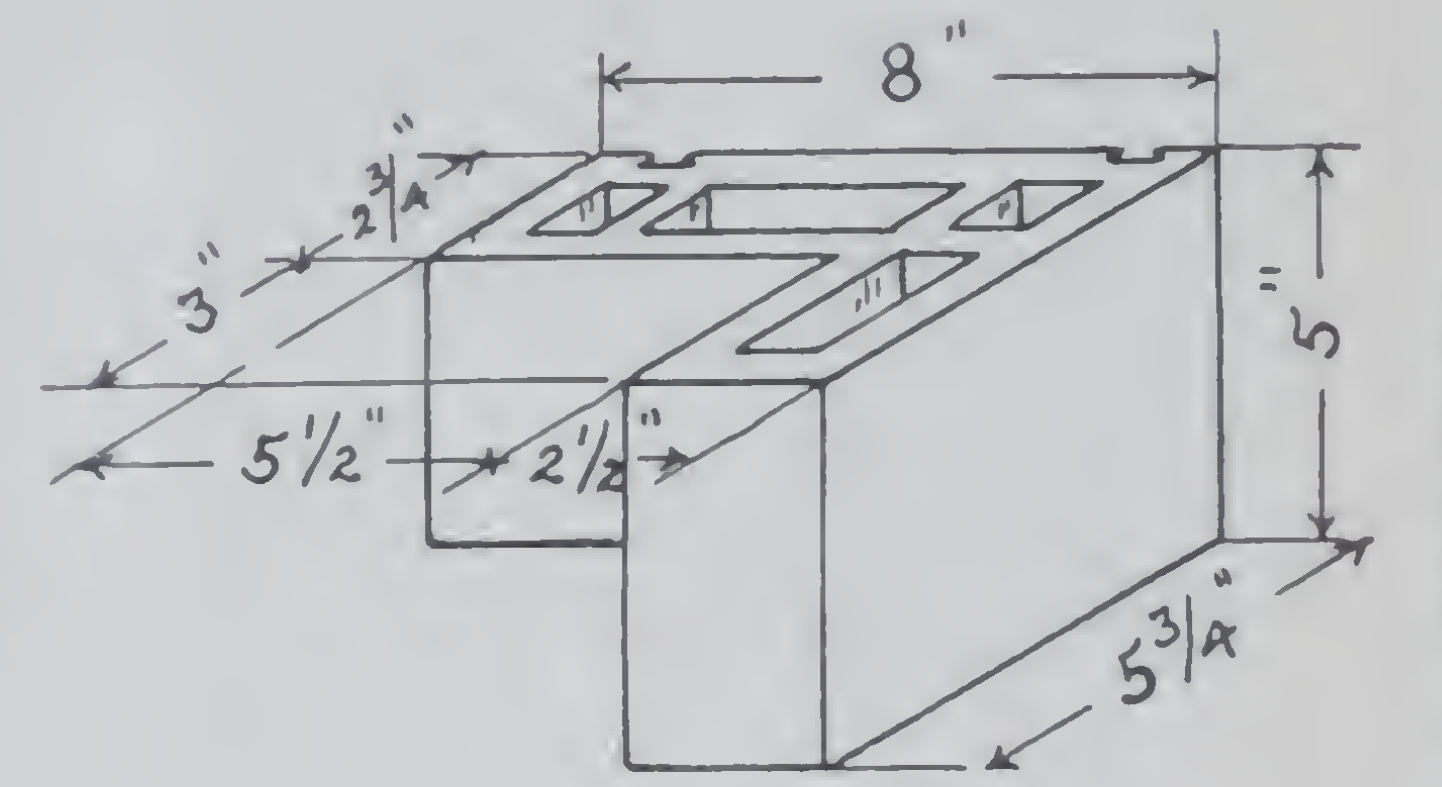
8" JAMB TILE



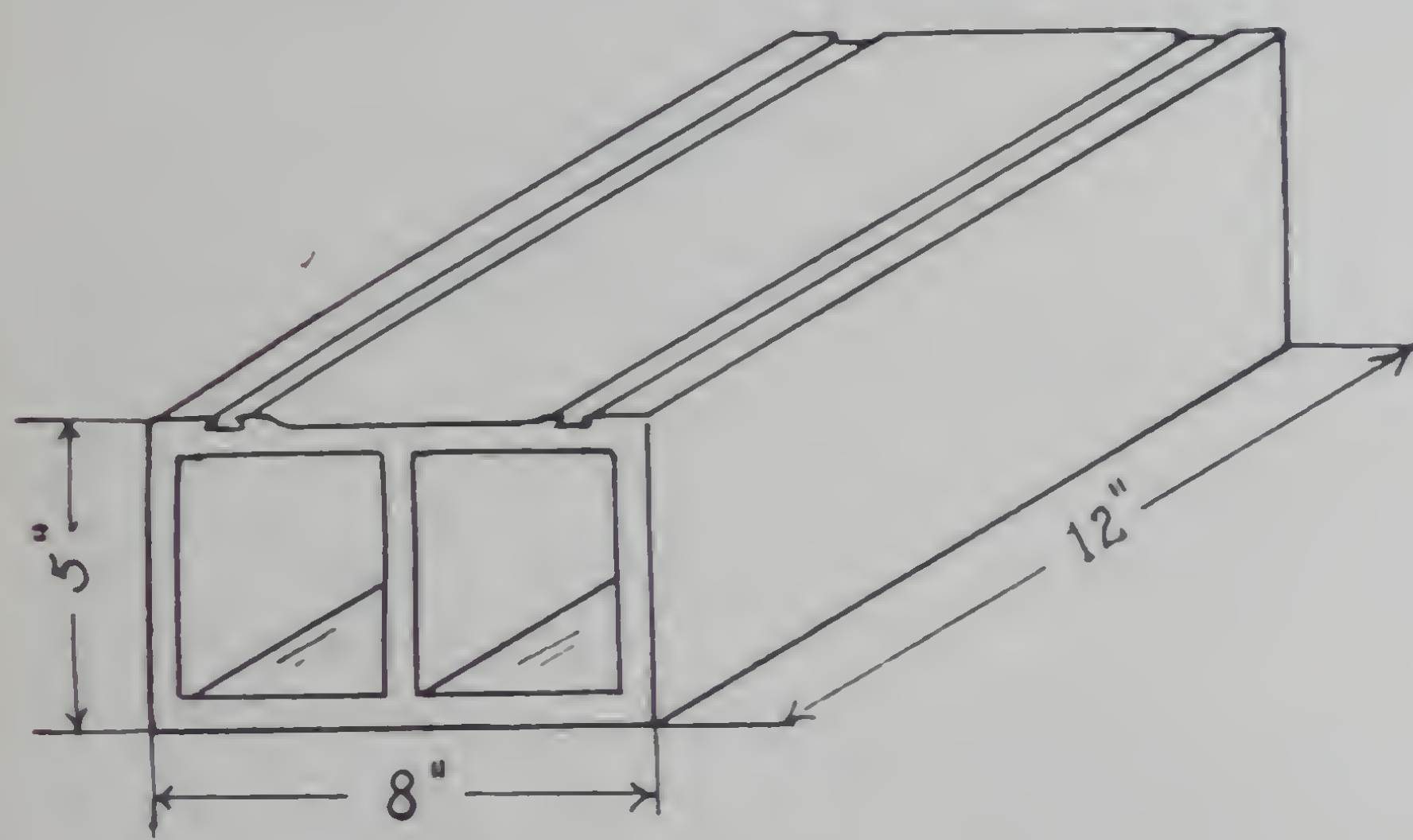
8" HALF CLOSURE



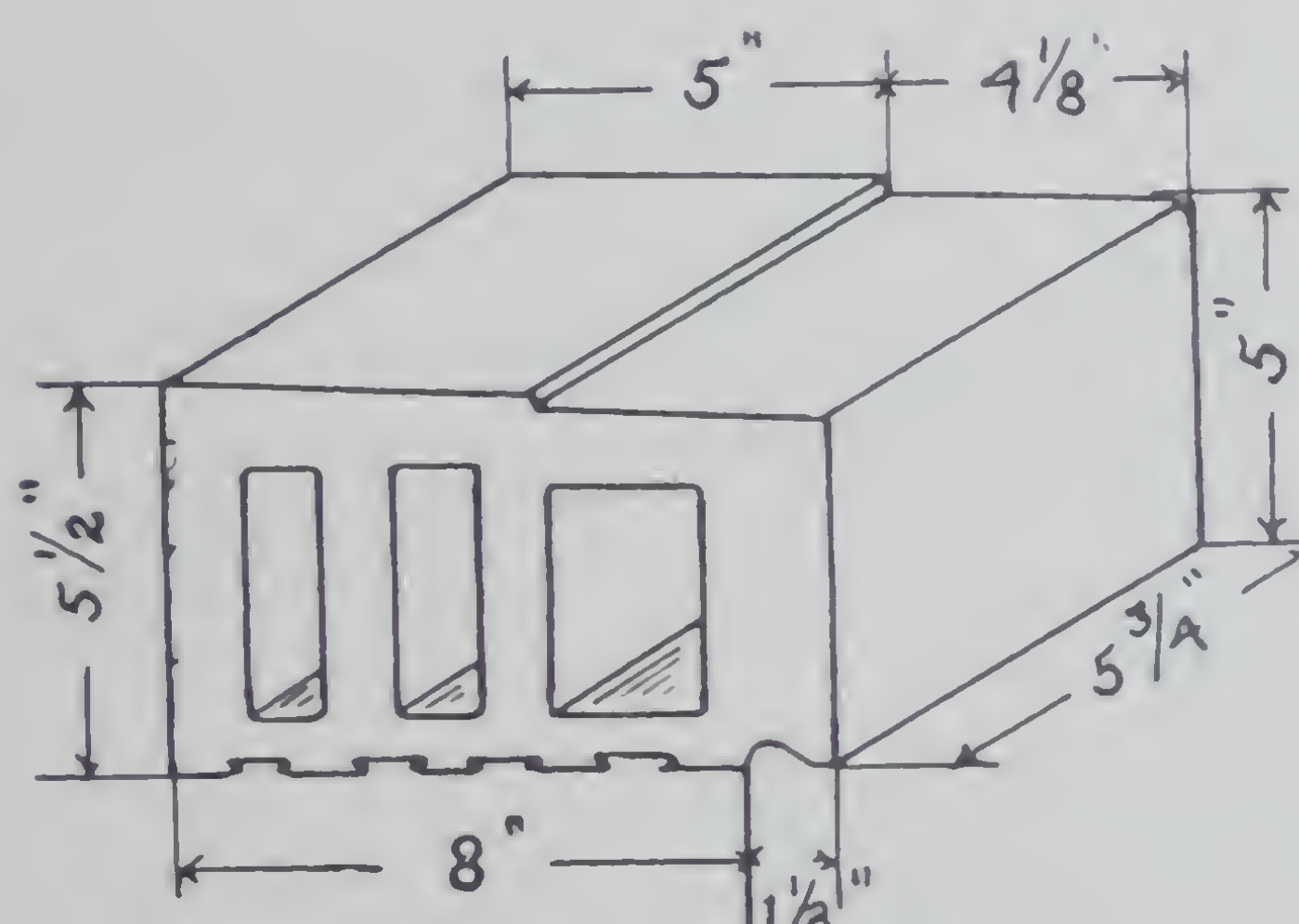
8" SOLDIER LINTEL



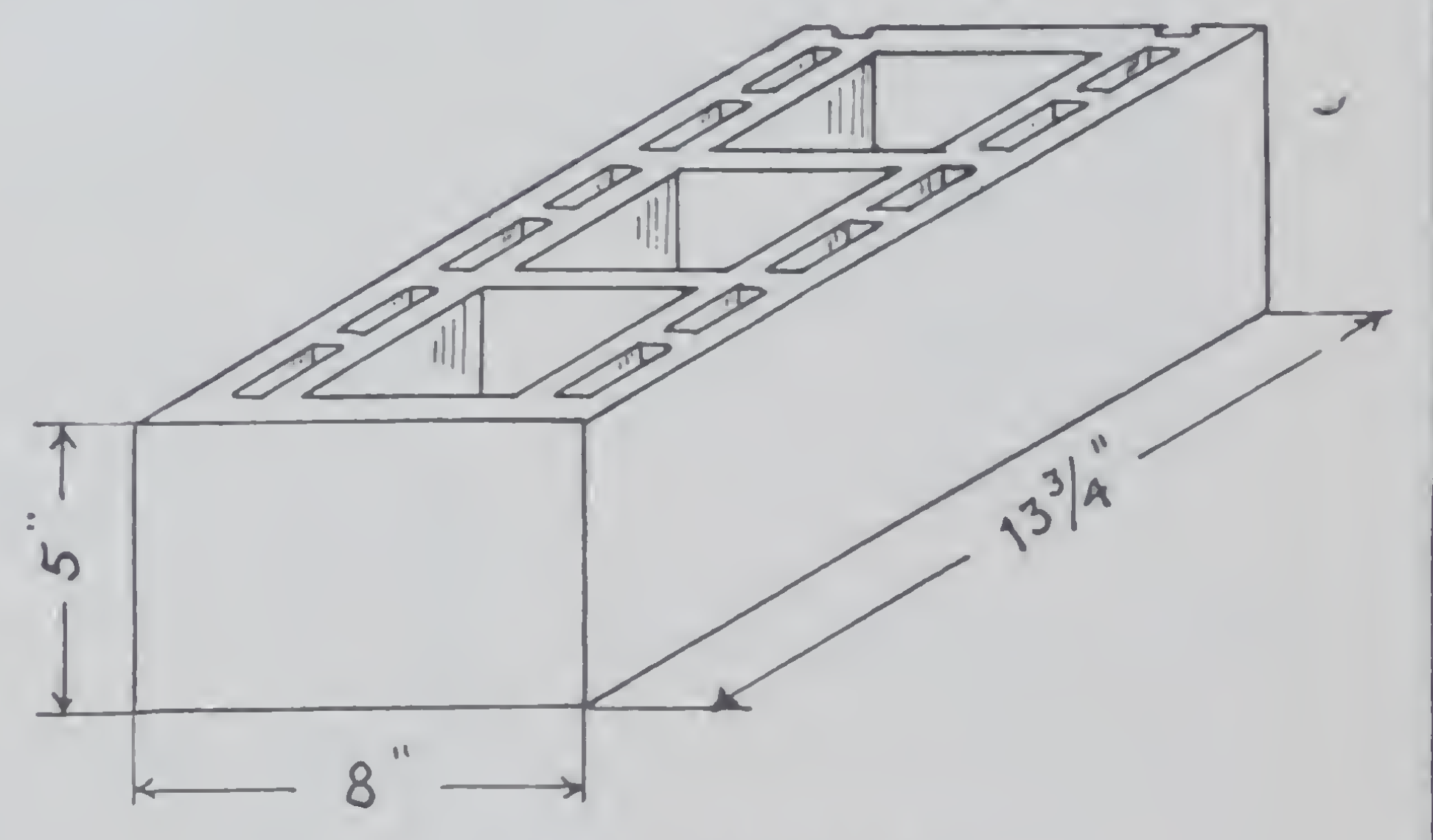
8" HALF JAMB



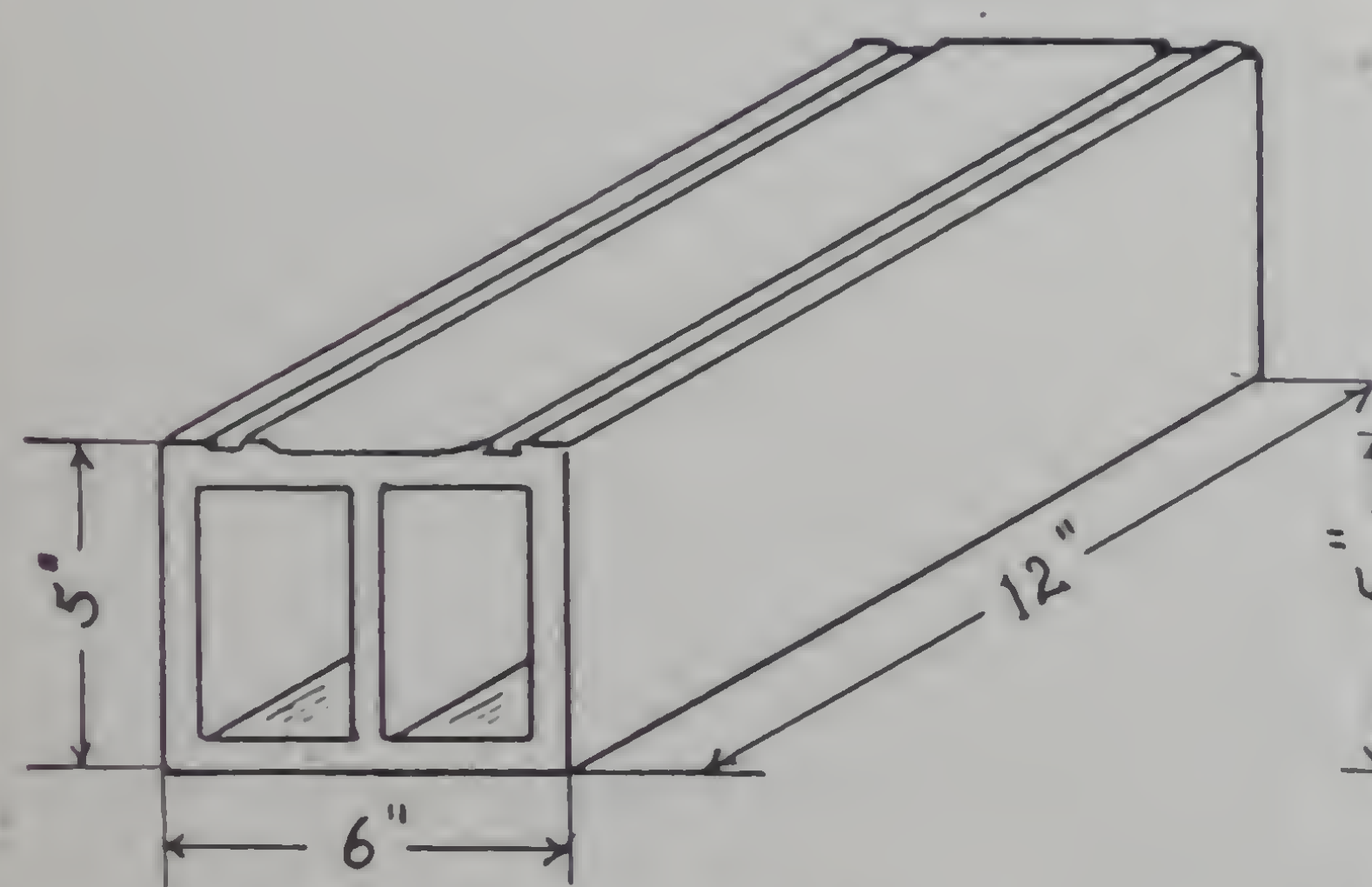
8" LINTEL



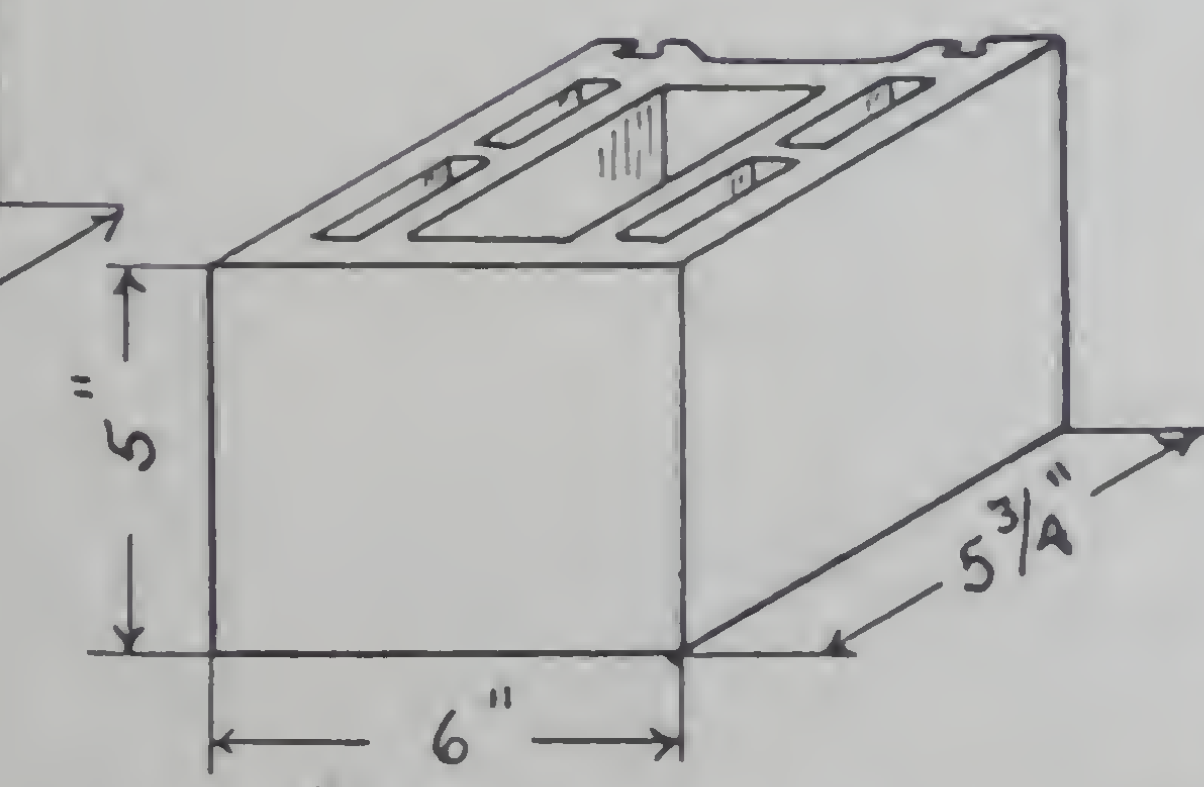
8" SILL



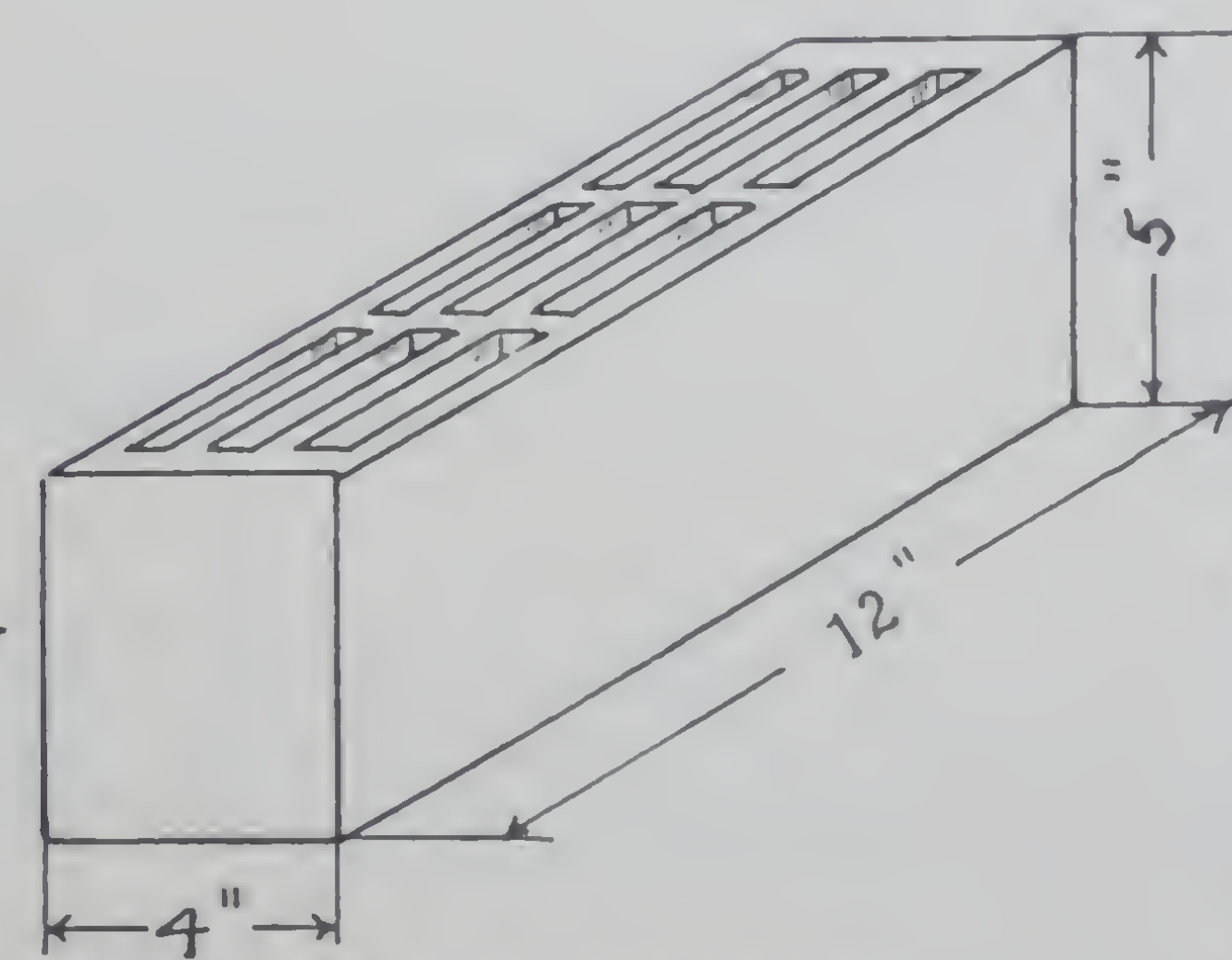
8" INSIDE CORNER



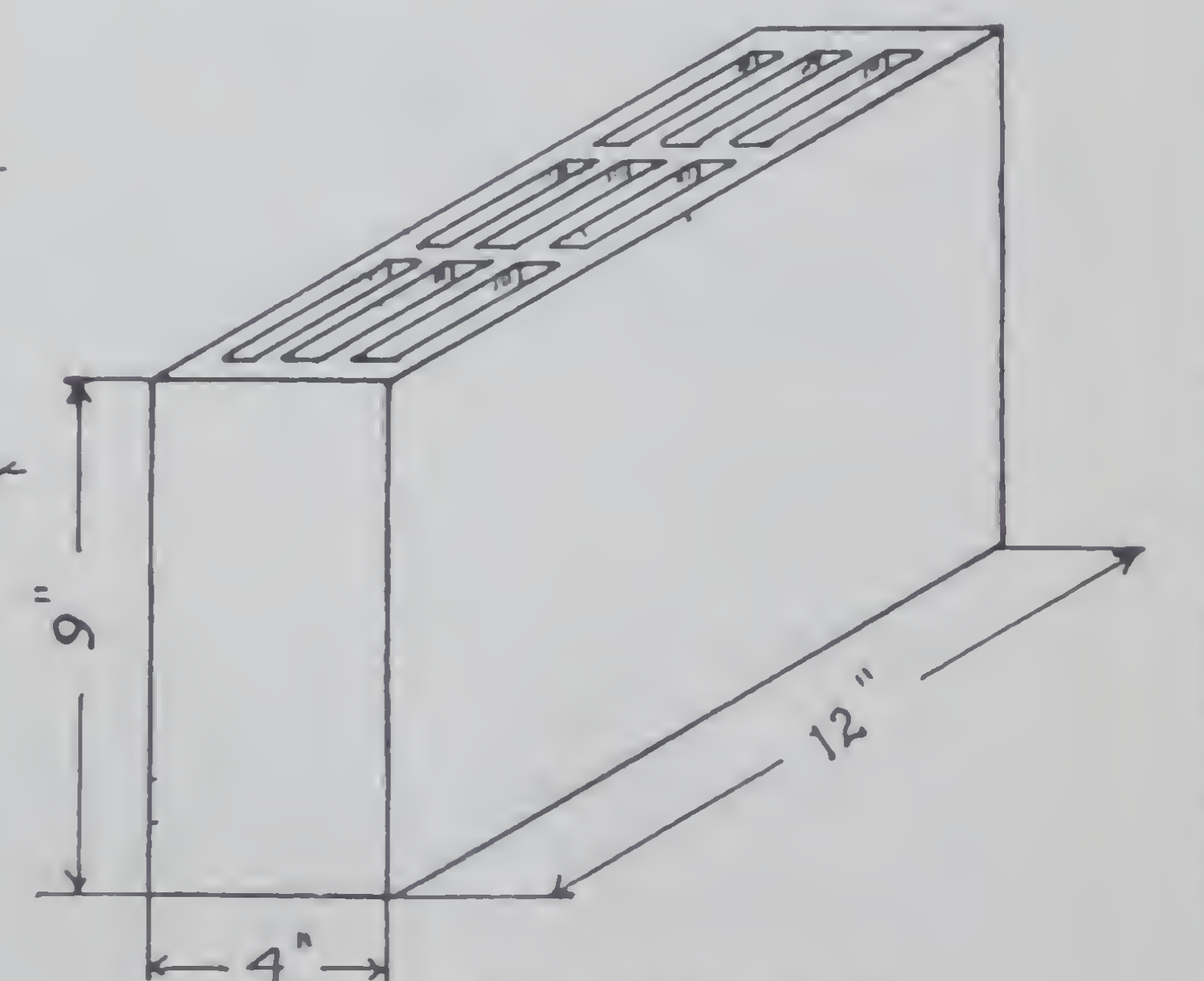
6" LINTEL



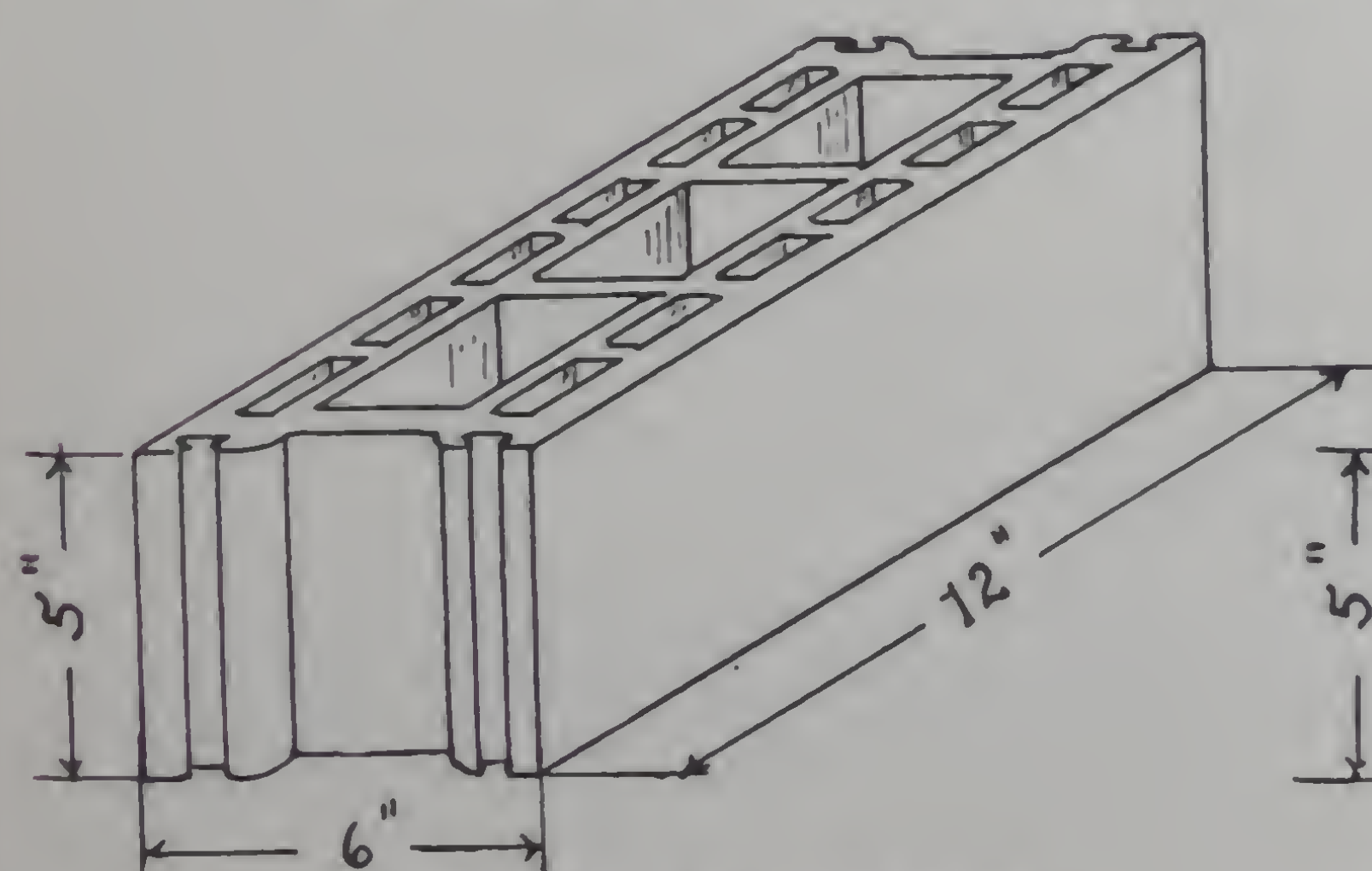
6" HALF CLOSURE



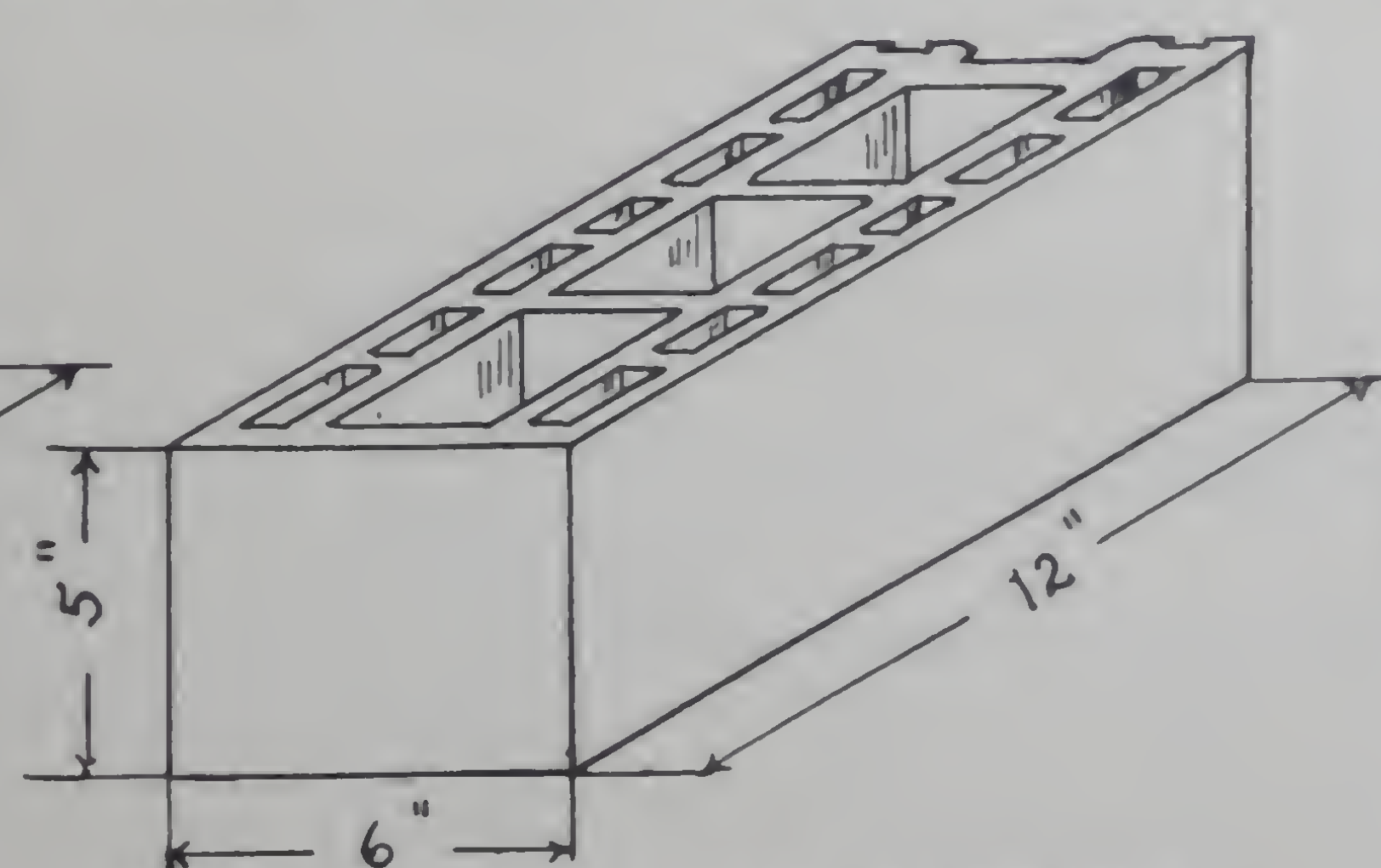
4" JOIST CLOSURE



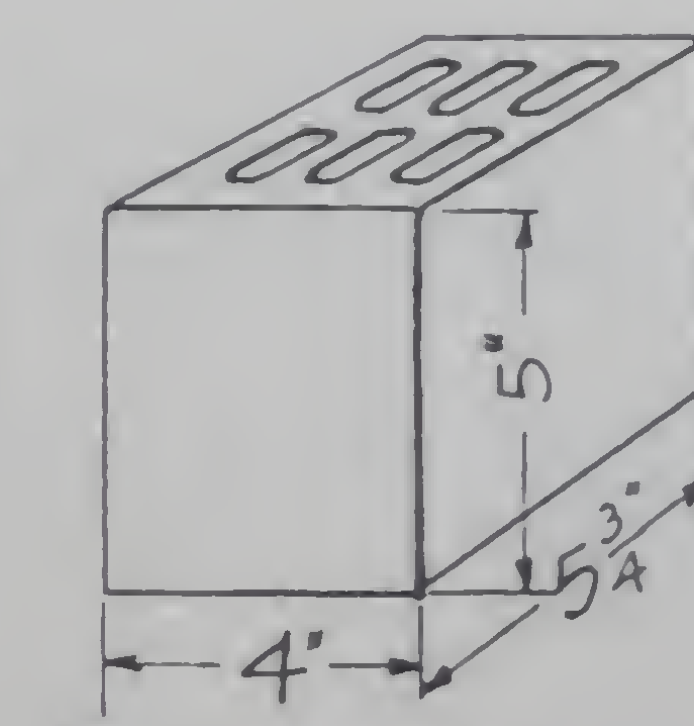
4" JOIST FILLER



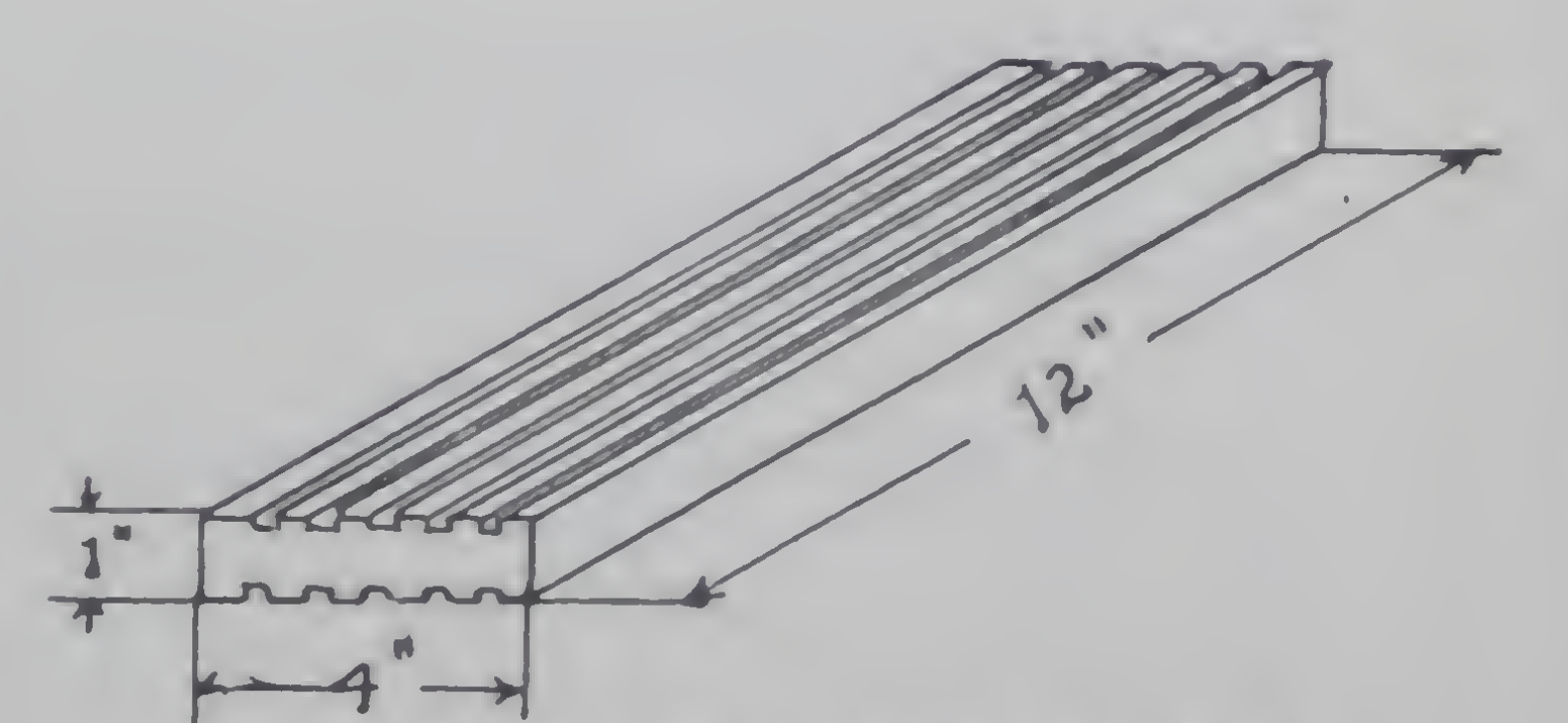
6" WALL TILE



6" CLOSURE OR CORNER



PILASTER

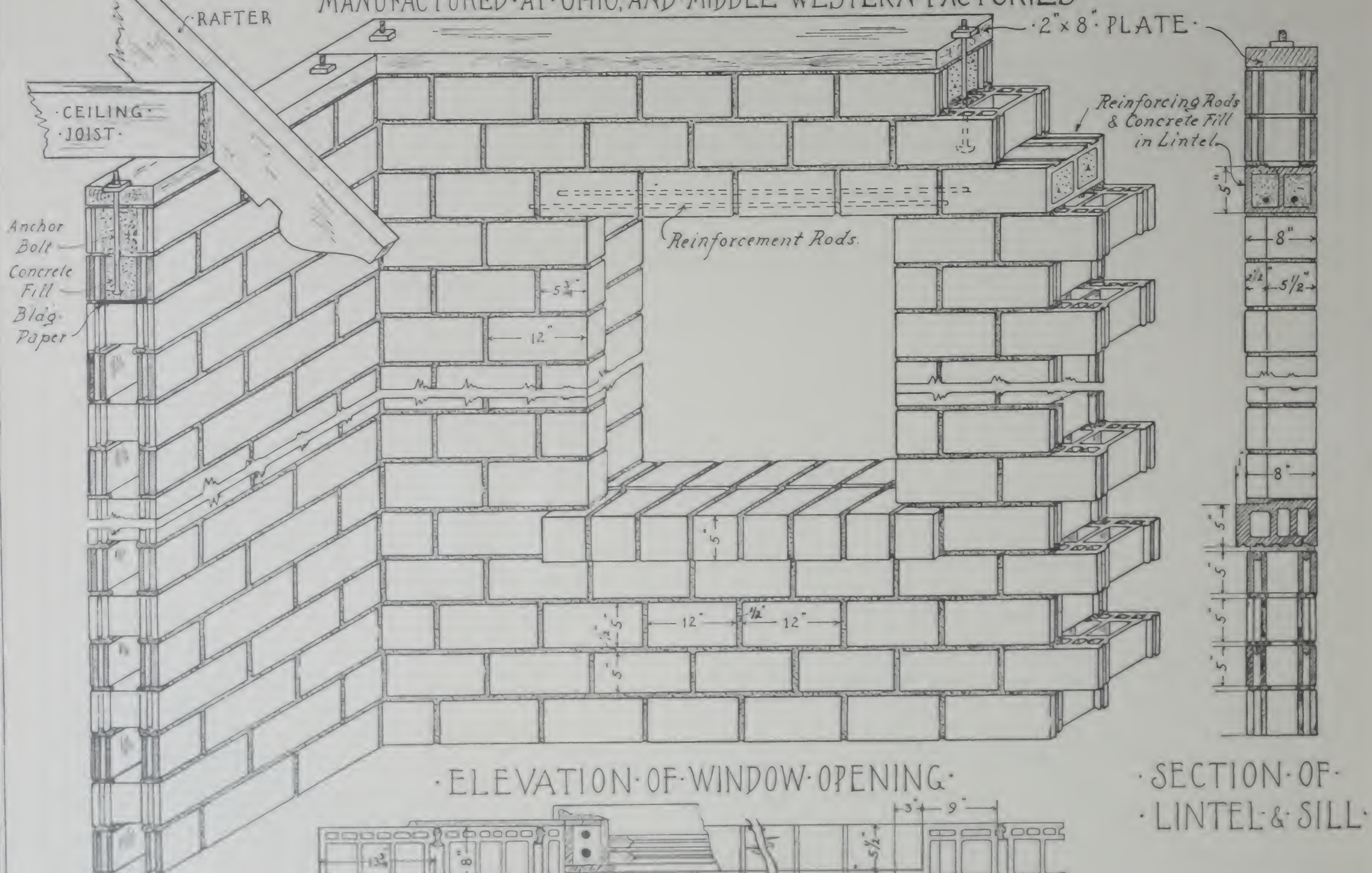


1" BEARING SLAB



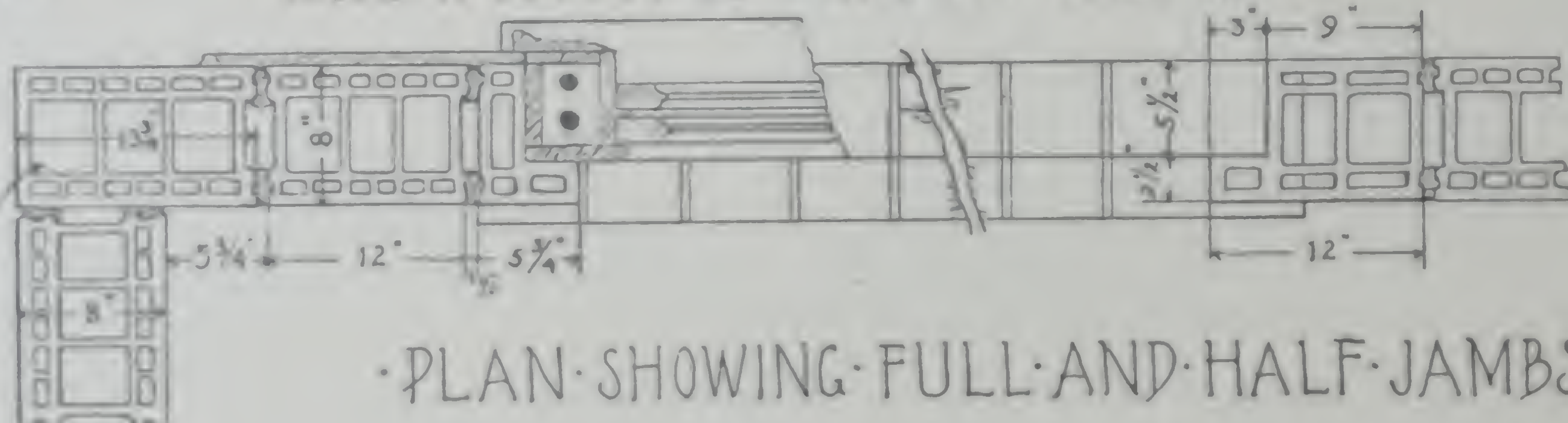
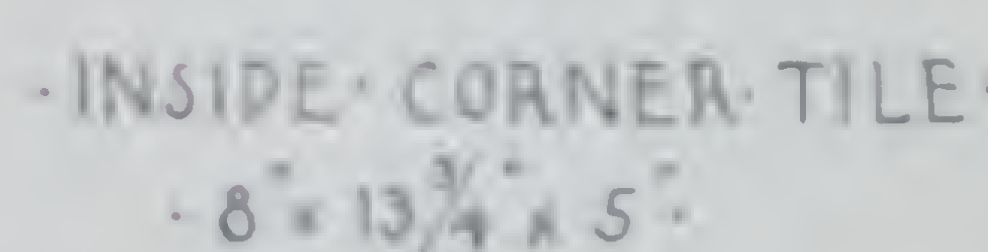
DETAILS OF 8" WALL OF NATCO DOUBLE SHELL TILE.  
MANUFACTURED AT OHIO AND MIDDLE-WESTERN FACTORIES.

MANUFACTURED AT OHIO AND MIDDLE-WESTERN FACTORIES

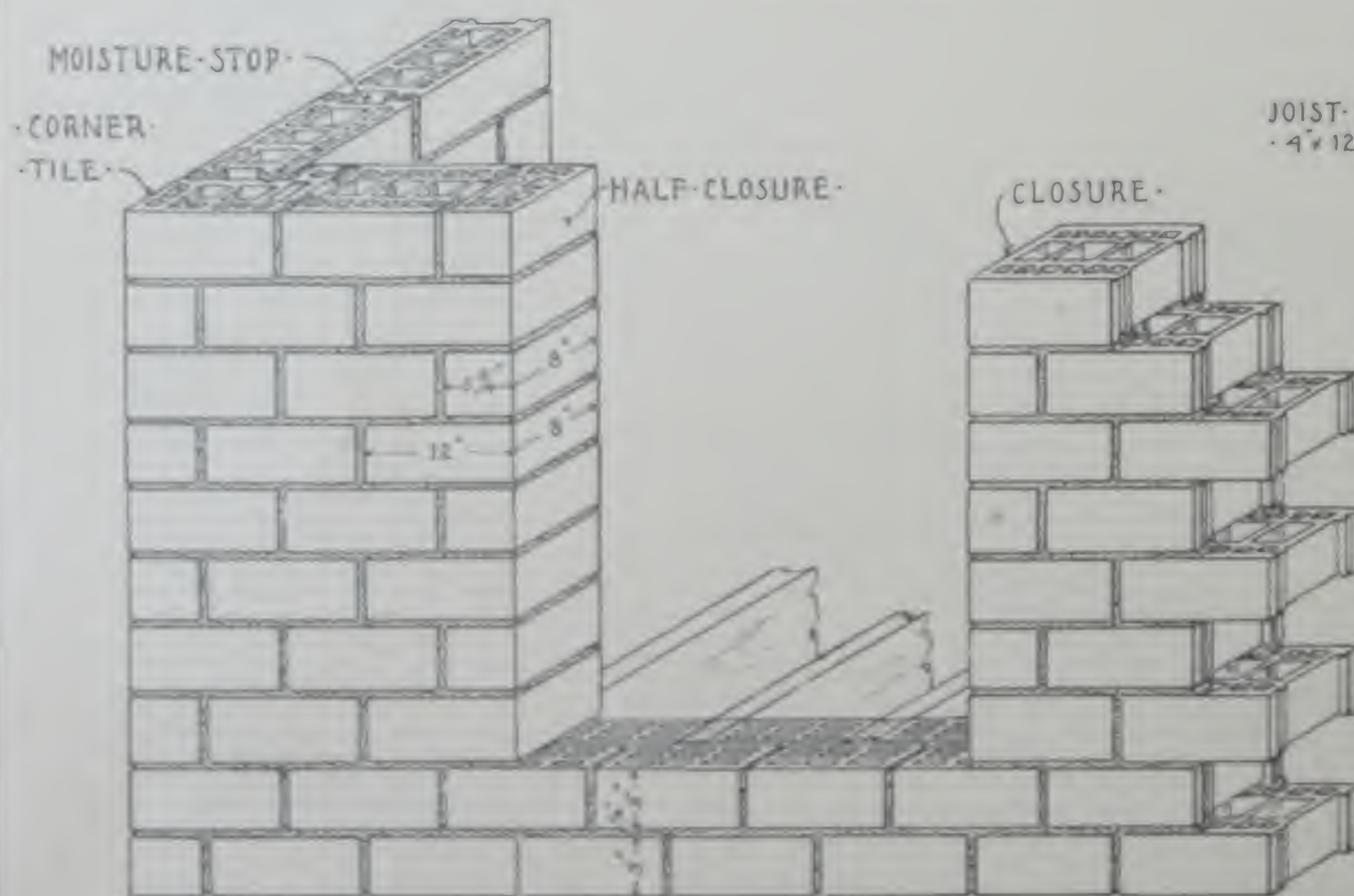


·ELEVATION·OF·WINDOW·OPENING·

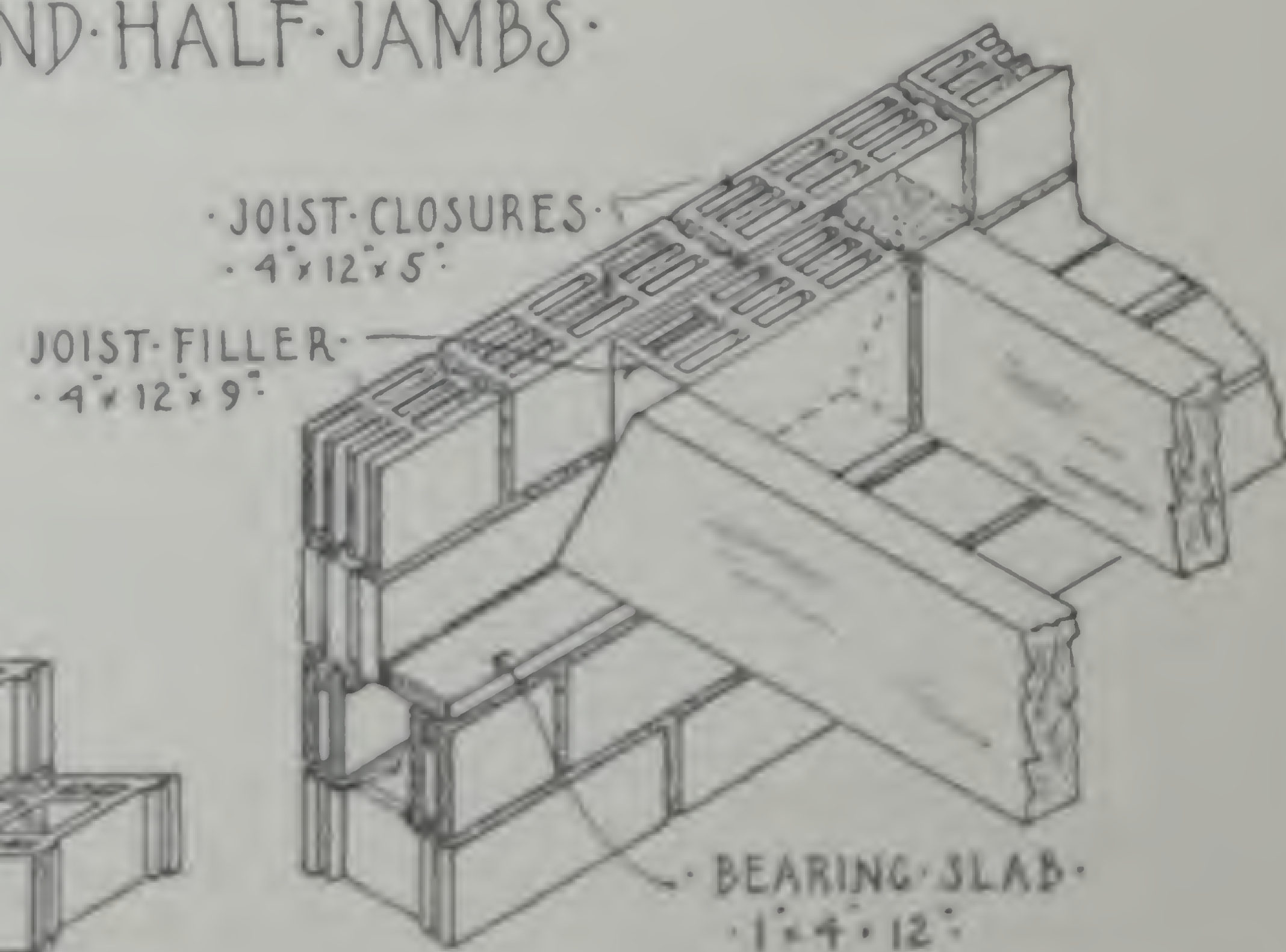
SECTION OF  
LINTEL & SILL



·PLAN·SHOWING·FULL·AND·HALF·JAMBS·



ELEVATION OF DOOR-OPENING AND EXTERNAL ANGLE.



· ISOMETRIC VIEW OF JOIST ·  
· BEARING CONSTRUCTION ·



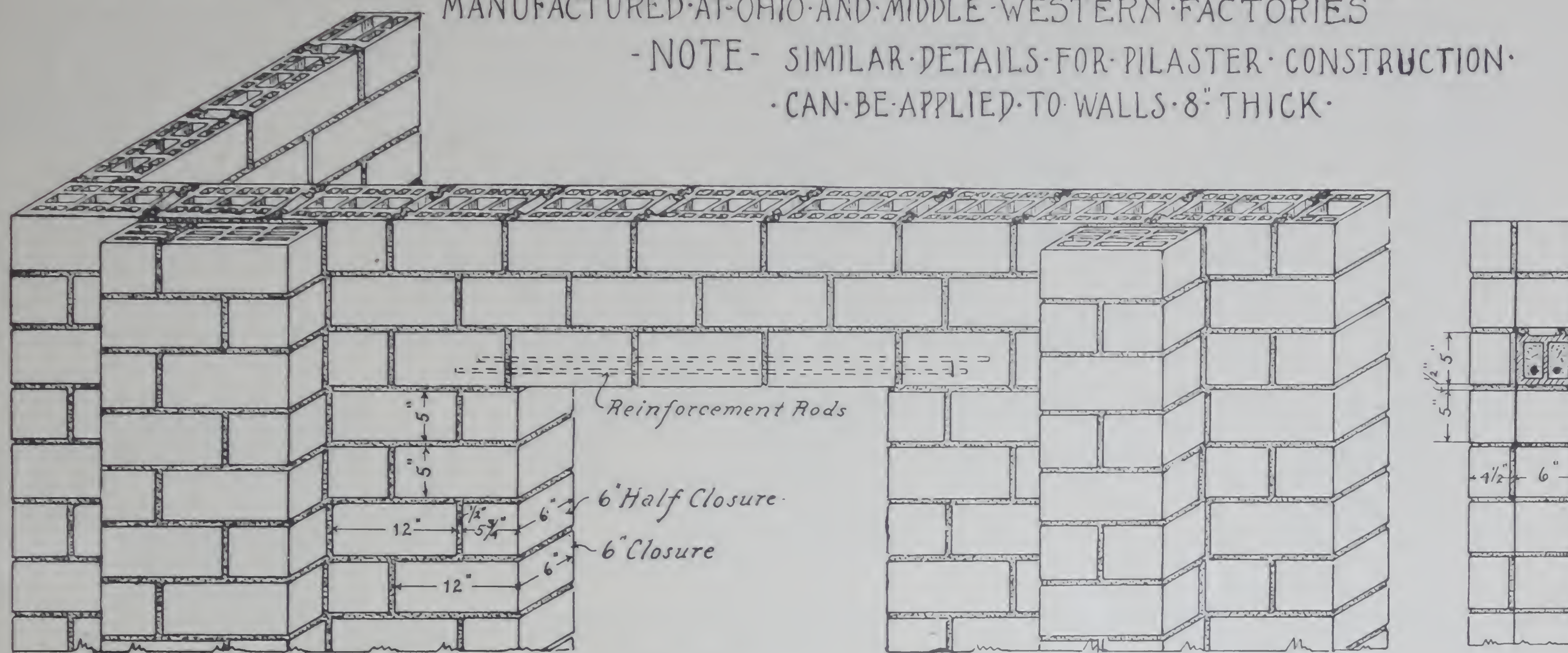
PLAN-SHOWING-JOIST-BEARING-



# DETAILS OF 6" WALL OF NATCO DOUBLE SHELL TILE

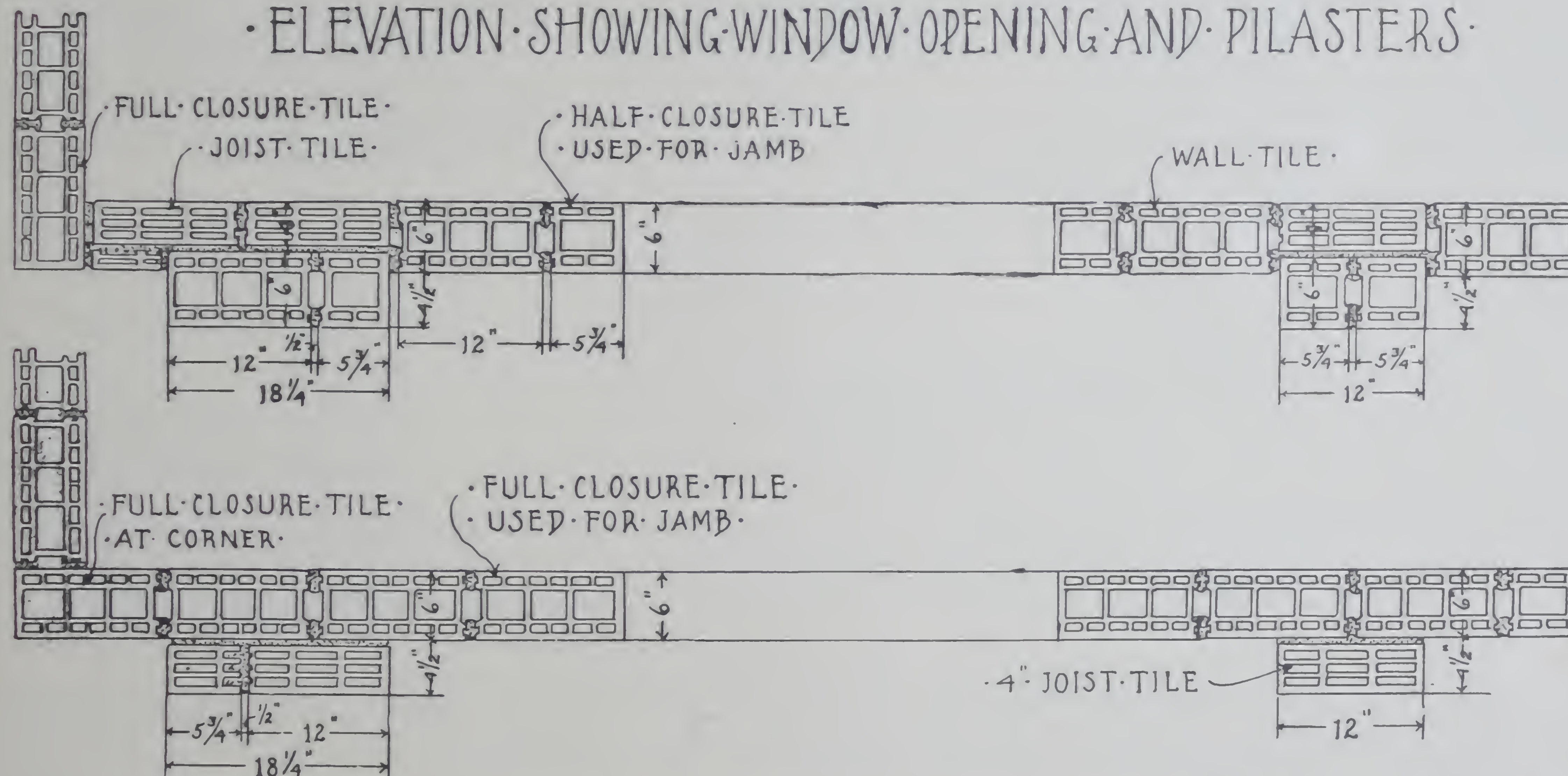
MANUFACTURED AT OHIO AND MIDDLE WESTERN FACTORIES

- NOTE - SIMILAR DETAILS FOR PILASTER CONSTRUCTION  
- CAN BE APPLIED TO WALLS 8" THICK

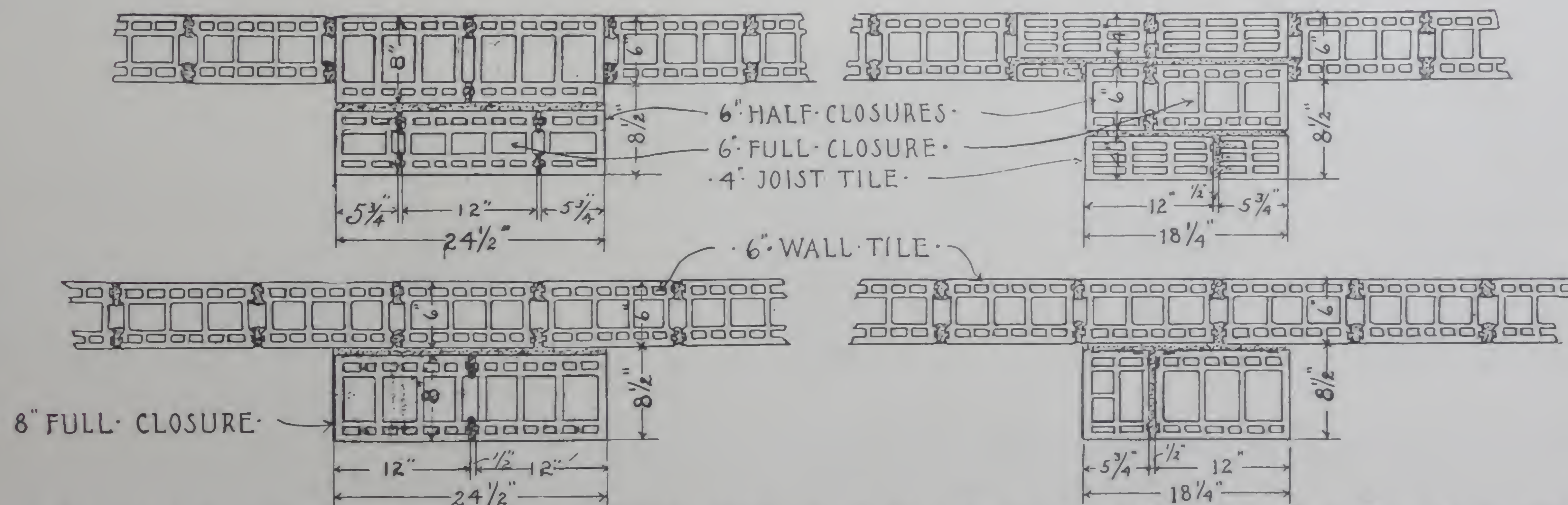


ELEVATION SHOWING WINDOW OPENING AND PILASTERS

SECTION OF LINTEL



PLANS SHOWING BONDING OF ALTERNATE COURSES OF 4 1/2" x 18 1/4" AND 4 1/2" x 12" PILASTERS

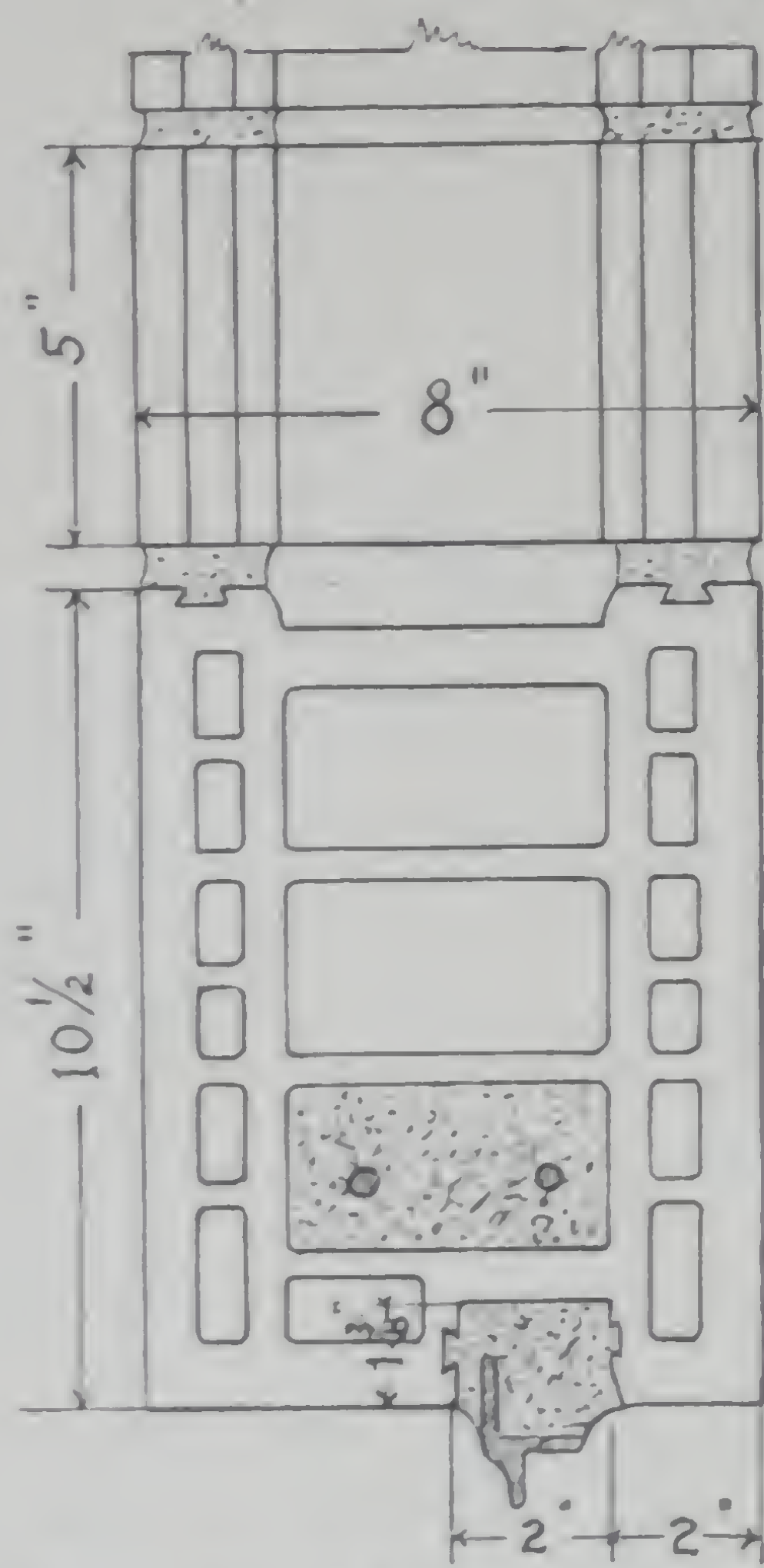


PLANS SHOWING BONDING OF ALTERNATE COURSES OF 8 1/2" x 24 1/2" AND 8 1/2" x 18 1/4" PILASTERS

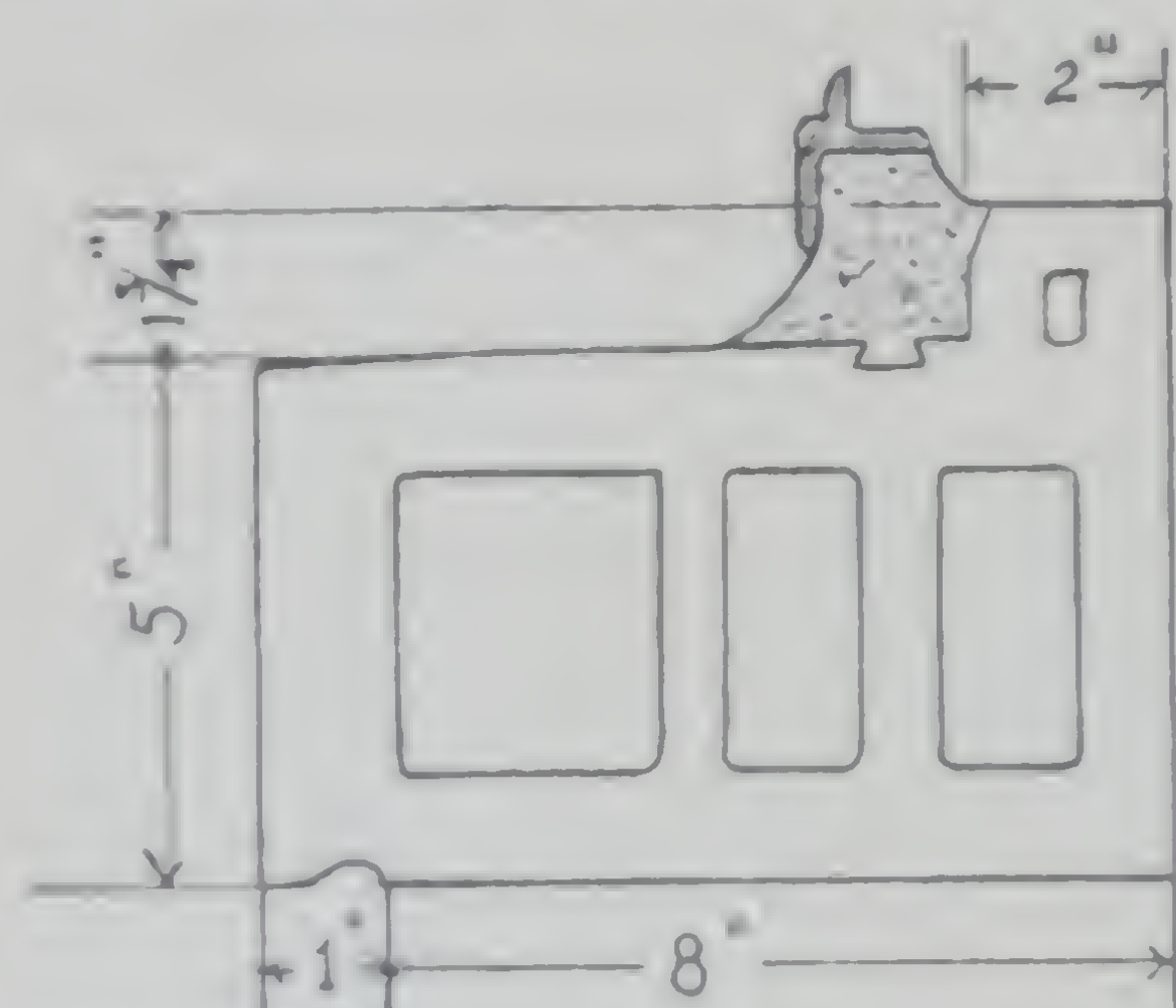


# DETAILS OF DOUBLE SHELL TILE FOR STEEL SASH.

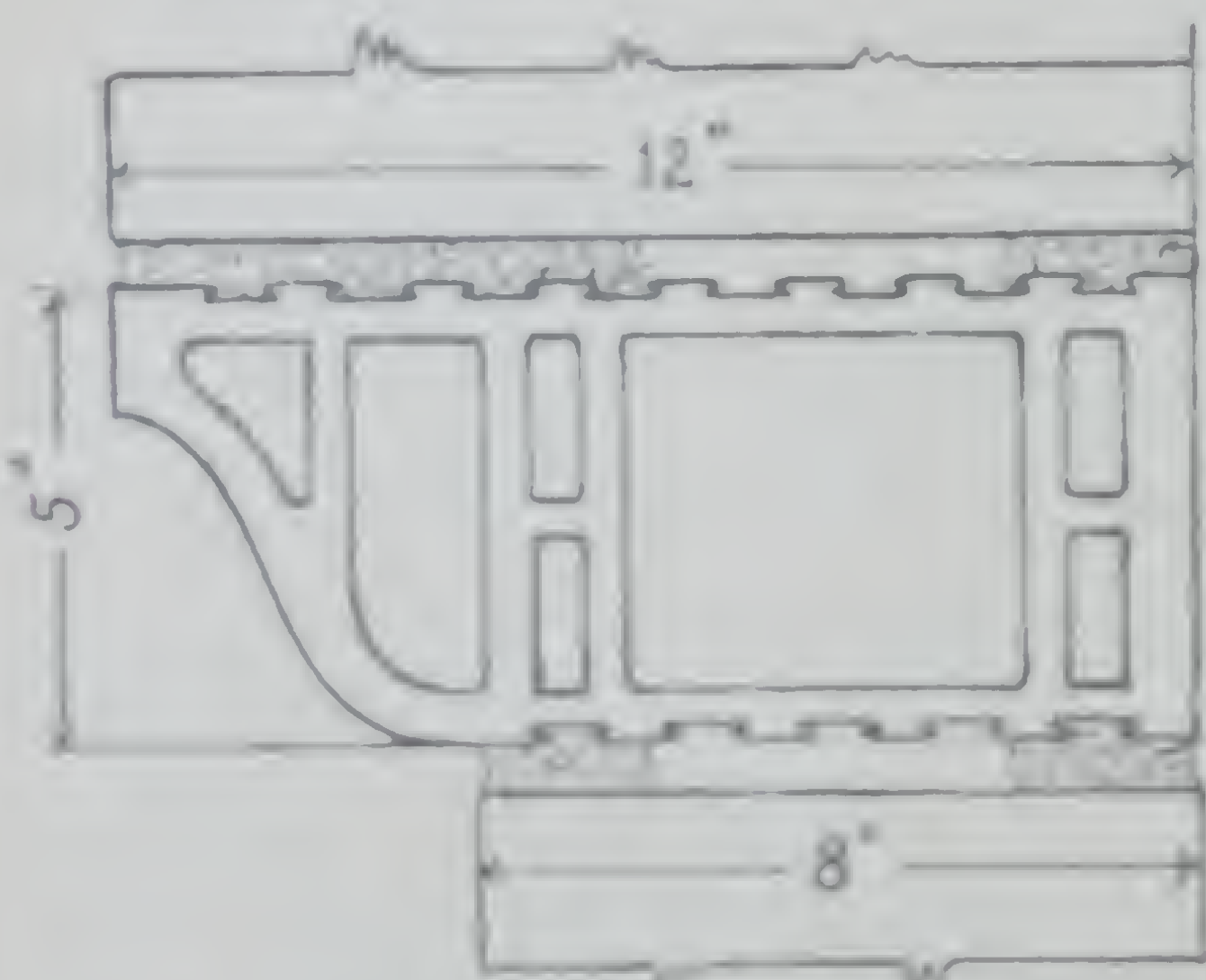
MANUFACTURED AT OHIO AND MIDDLE-WESTERN FACTORIES.



LINTEL TILE FOR STEEL SASH.  
REINFORCEMENT NOT REQUIRED  
IN SPANS OF LESS THAN 5'-0"



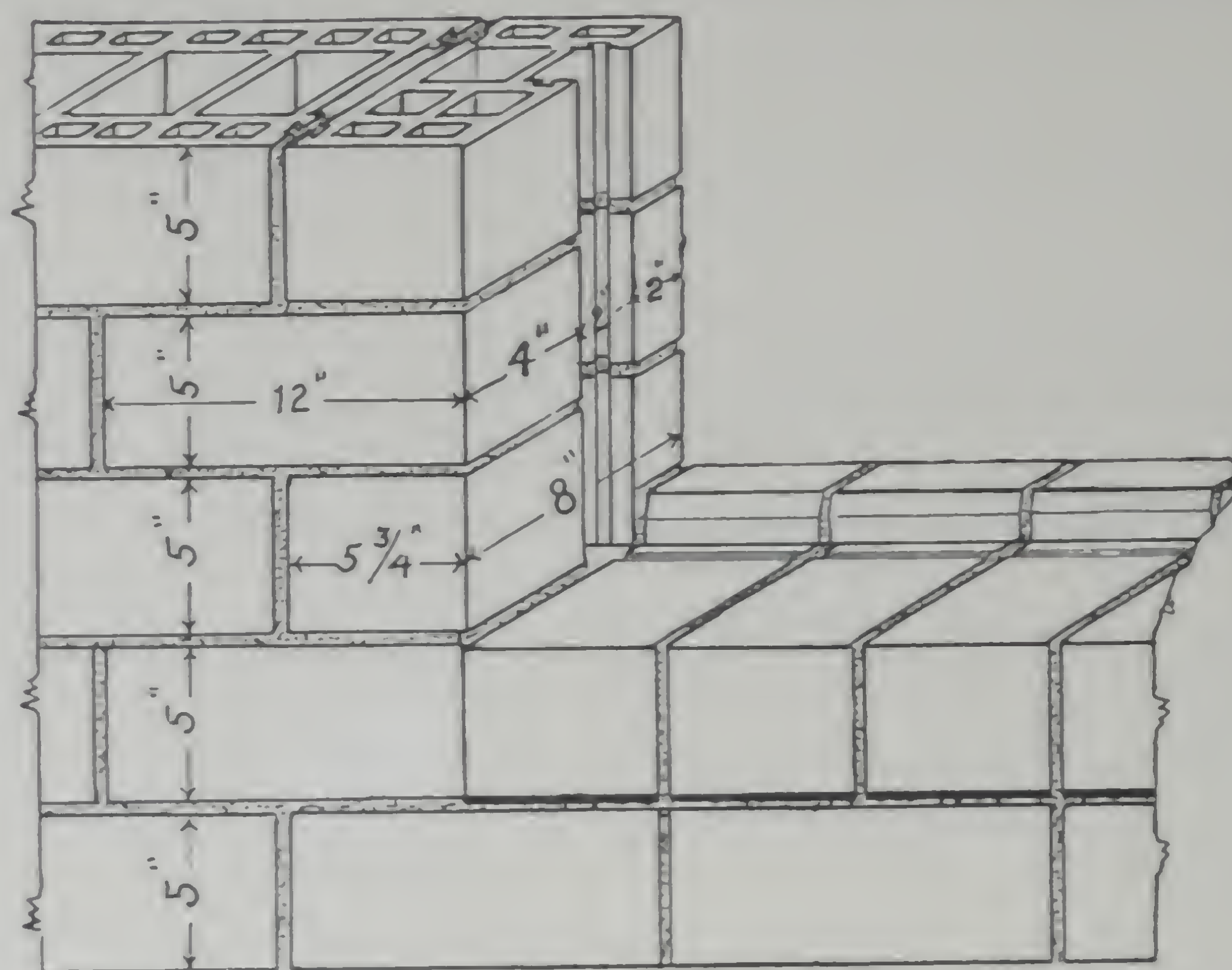
SILL TILE FOR STEEL SASH.



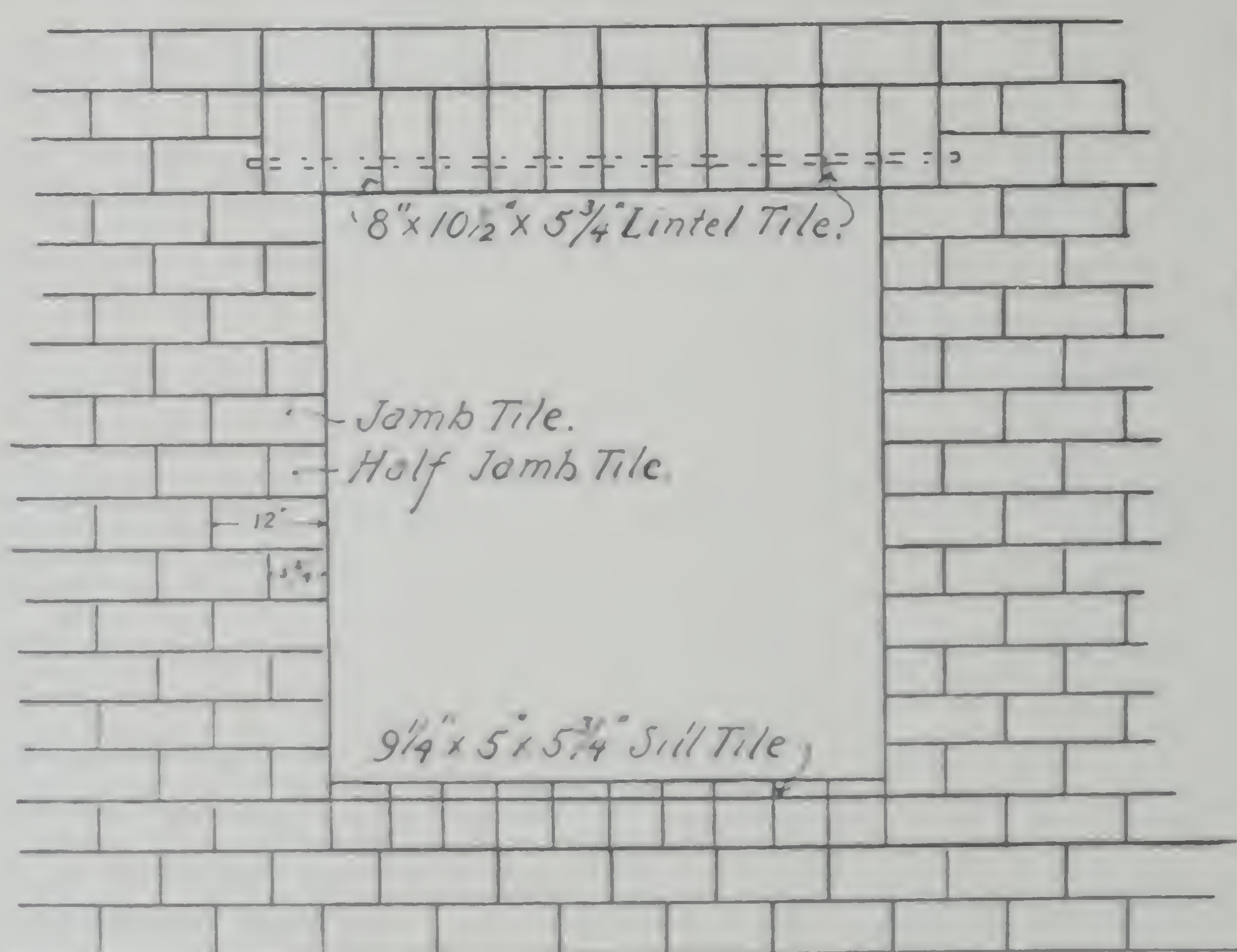
NATCO CORBEL TILE.



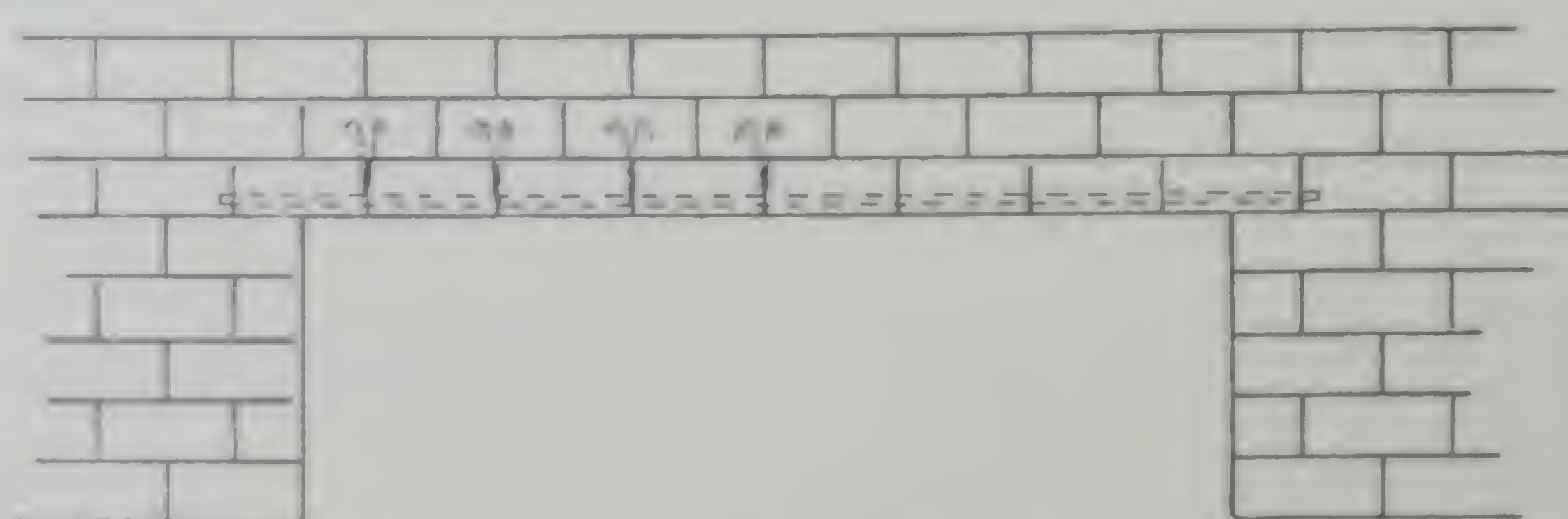
REINFORCED TILE LINTEL  
FOR WIDE SPANS.



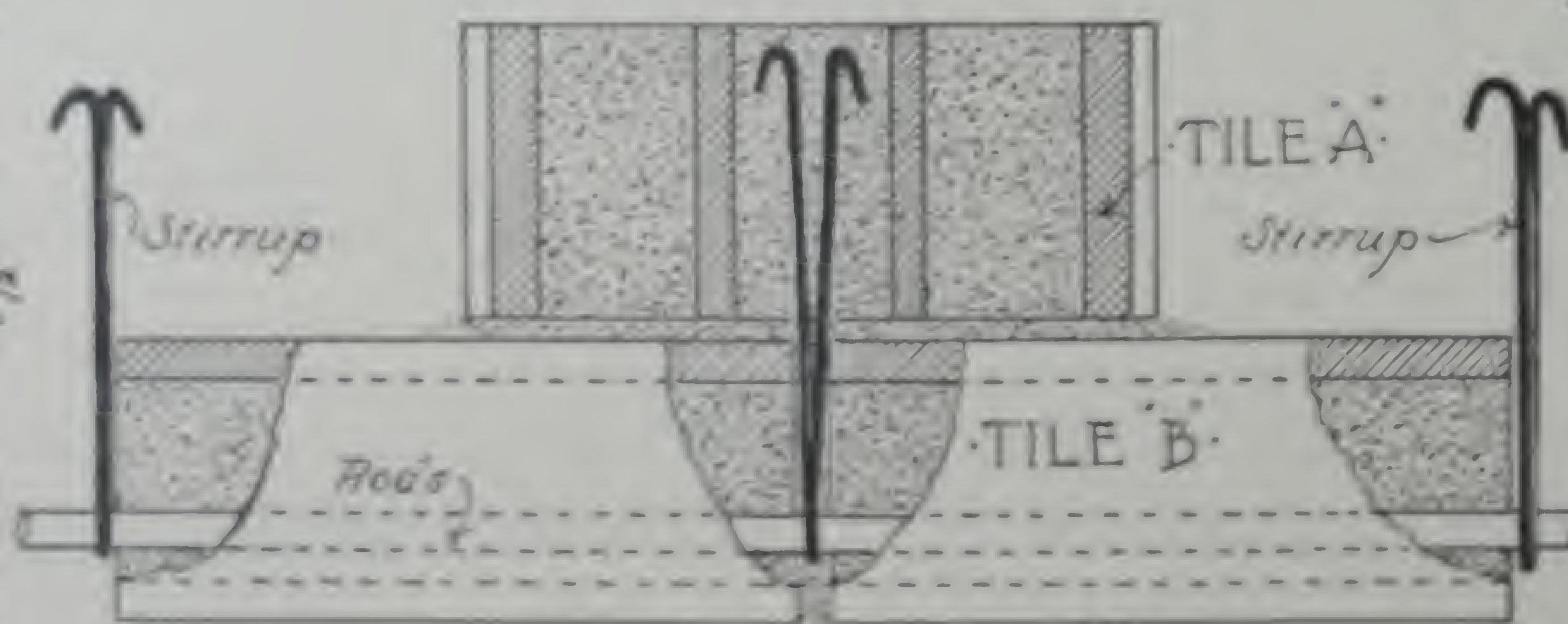
ELEVATION OF JAMB.



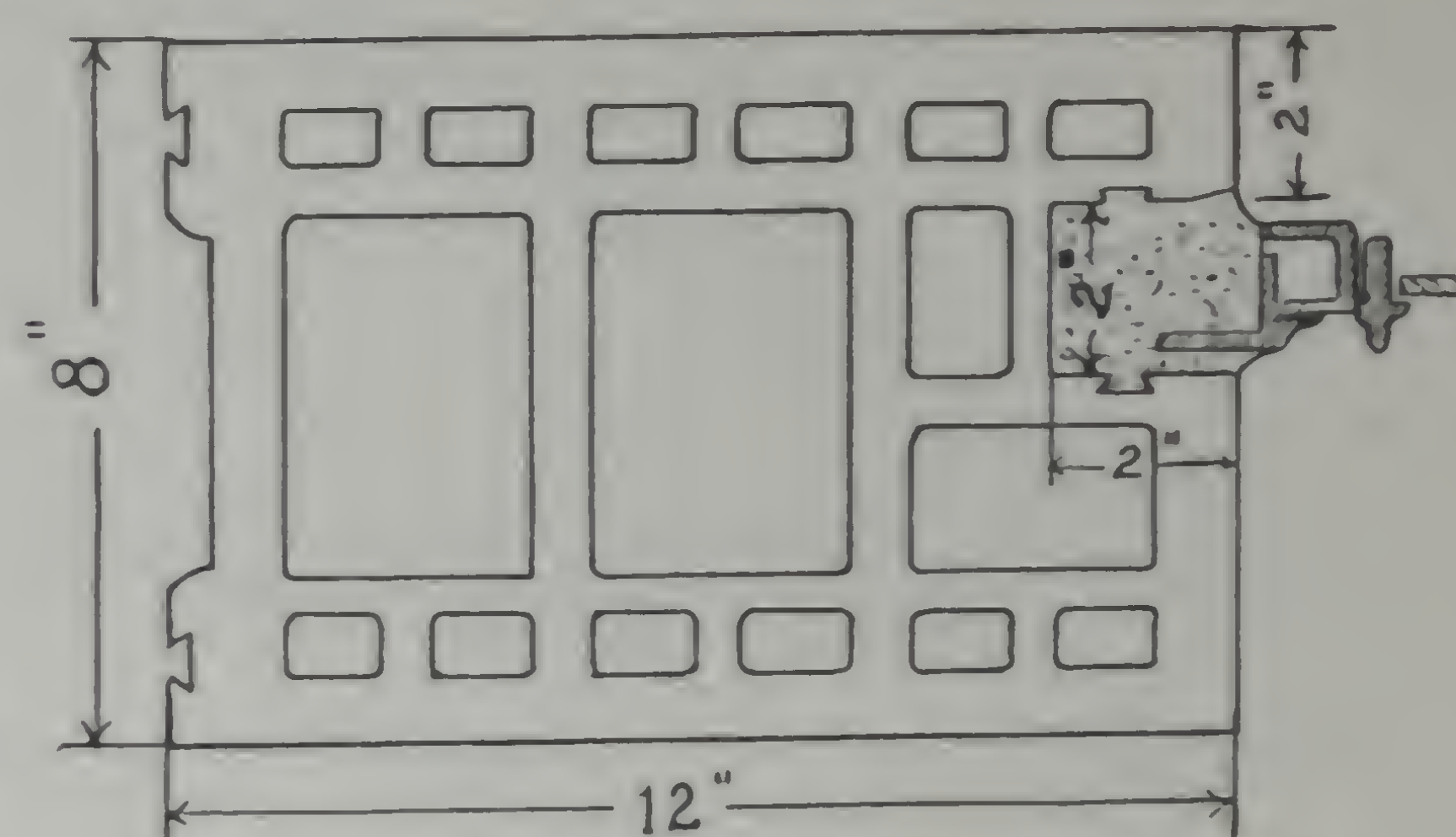
ELEVATION OF WINDOW OPENING.



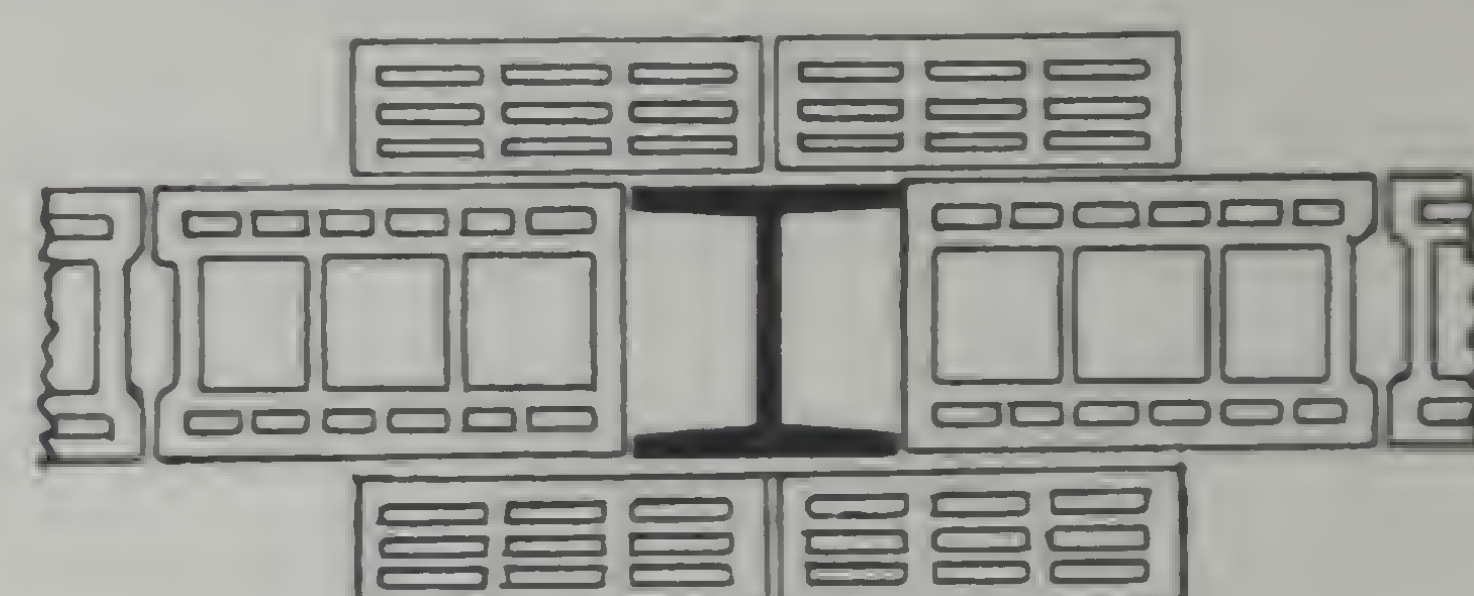
ELEVATION OF LINTEL FOR WIDE OPENINGS.



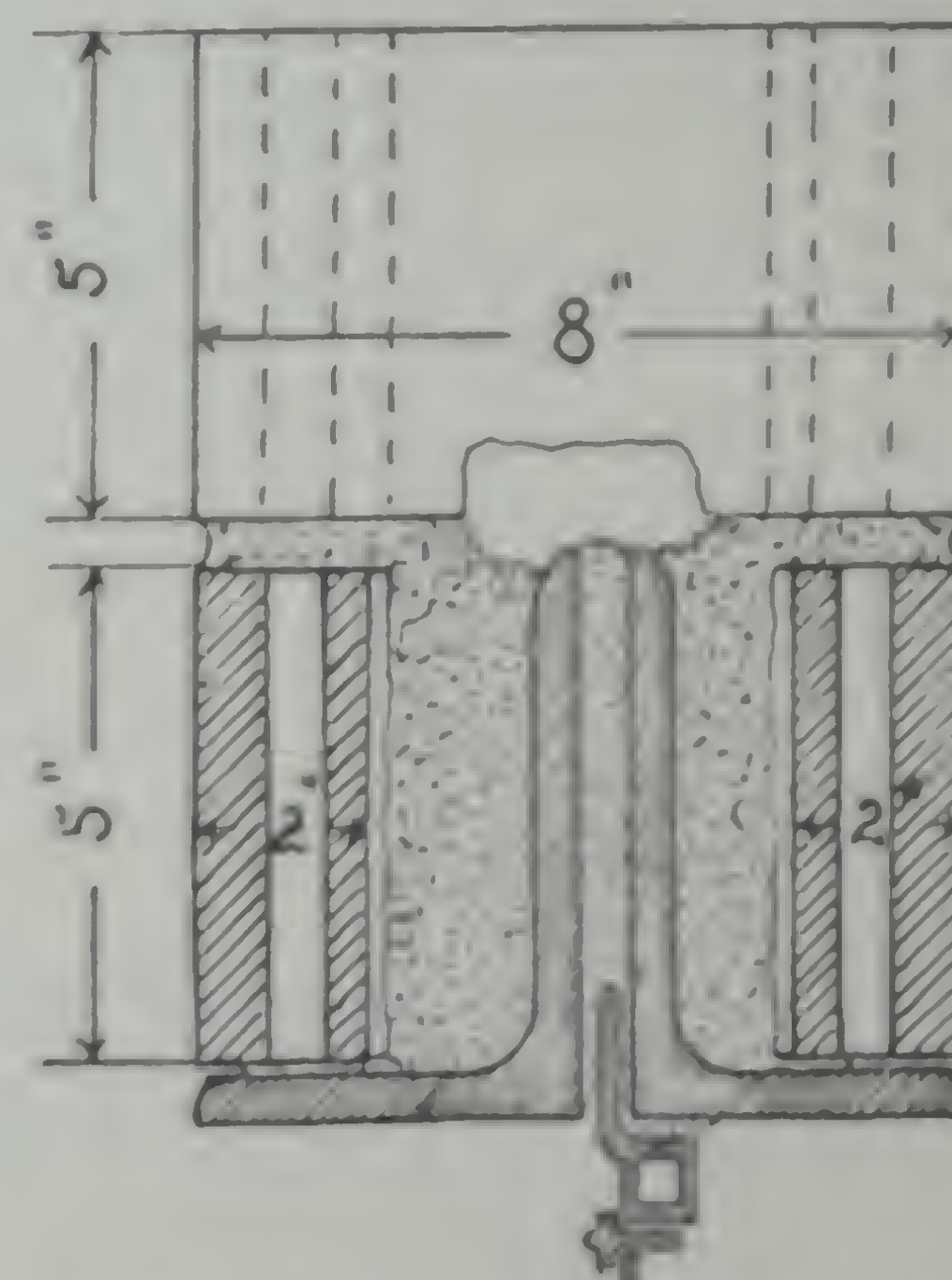
LONGITUDINAL SECTION A-A SHOWING STIRRUPS.  
AMOUNT OF REINFORCEMENT VARIES ACCORDING TO WEIGHT AND SPAN.  
FOR NARROW SPANS STIRRUPS AND CONCRETE FILL IN COURSE A ARE OMITTED.



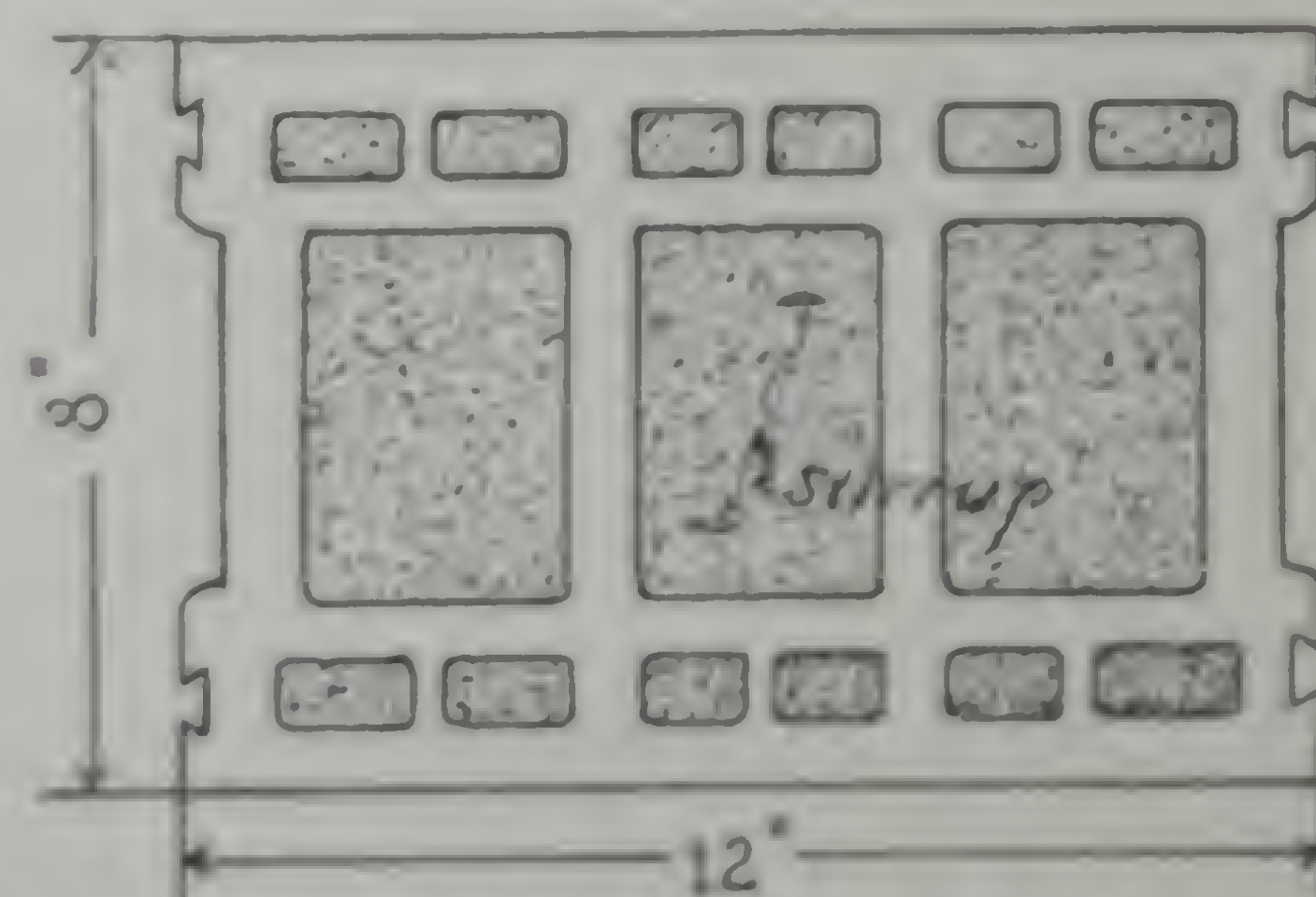
JAMB TILE FOR STEEL SASH.



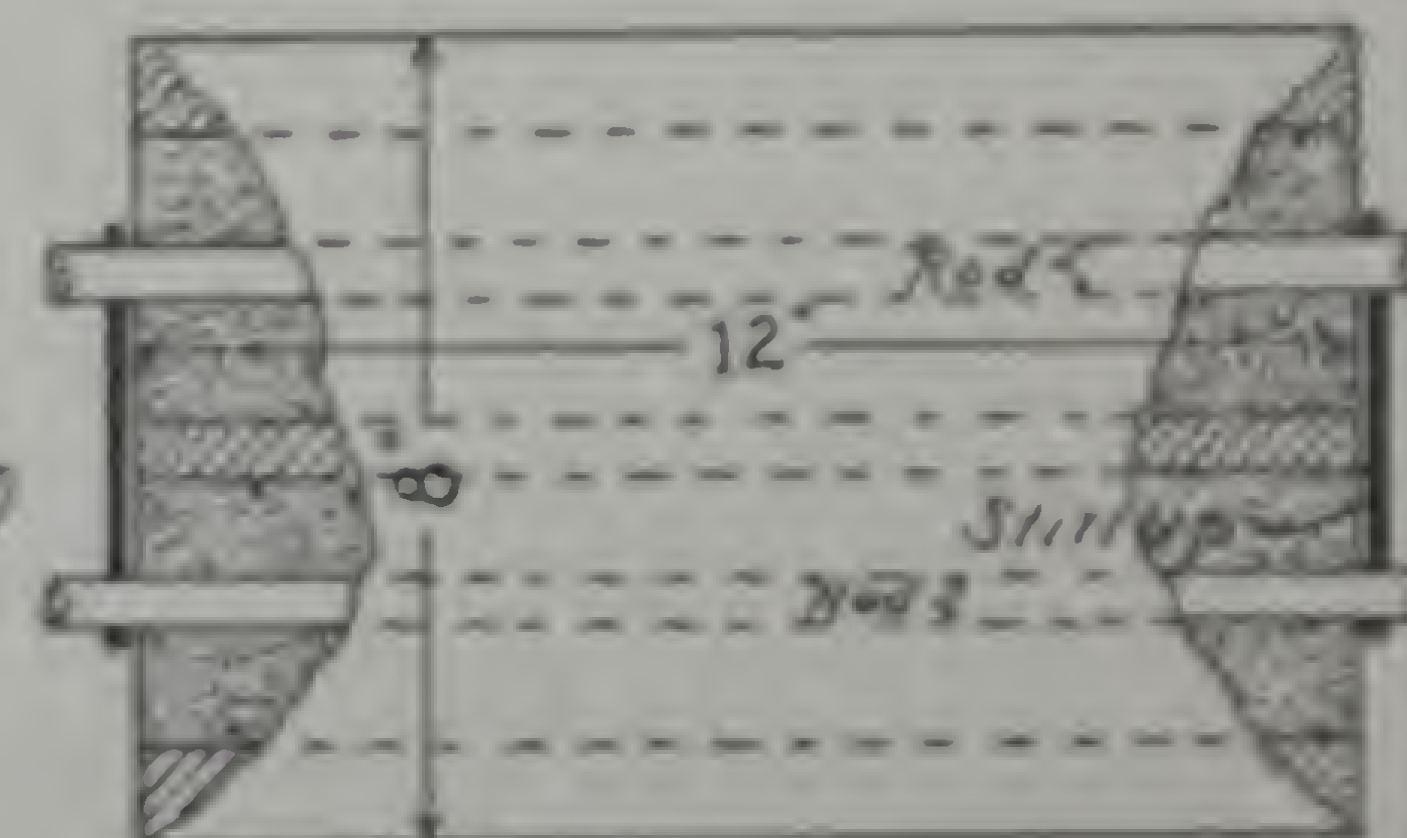
PILASTER CONSTRUCTION AT STEEL COLS.  
CORNER PILASTERS CAN ALSO BE CONSTRUCTED  
WITH STANDARD SHAPES.



TILE SUPPORTED ON ANGLES.



PLAN OF TILE A.

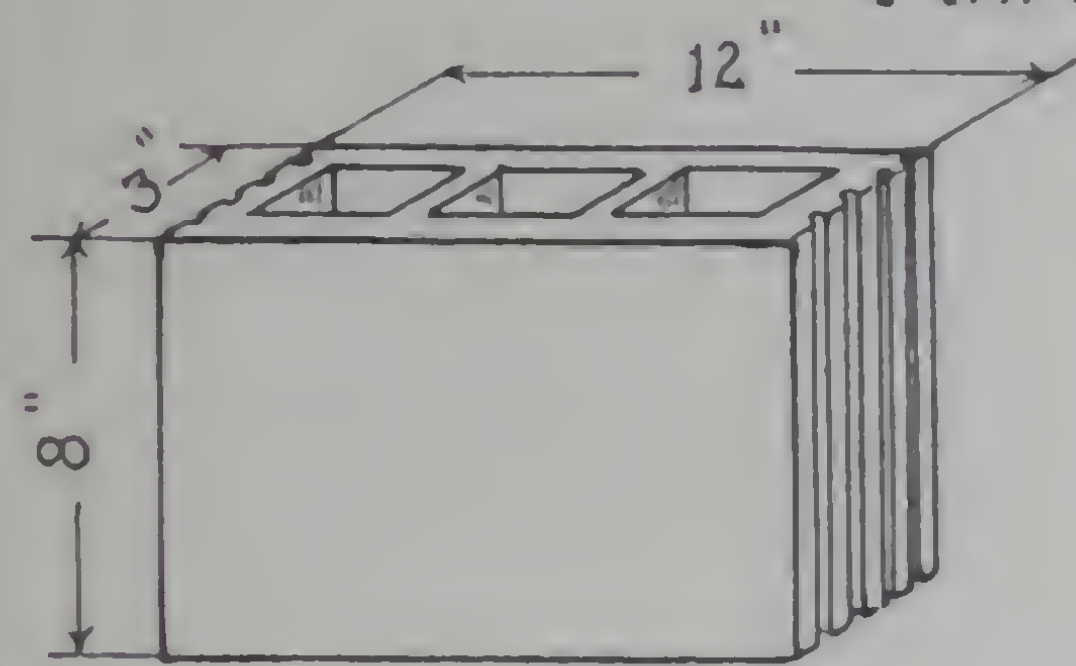


PLAN OF TILE B.

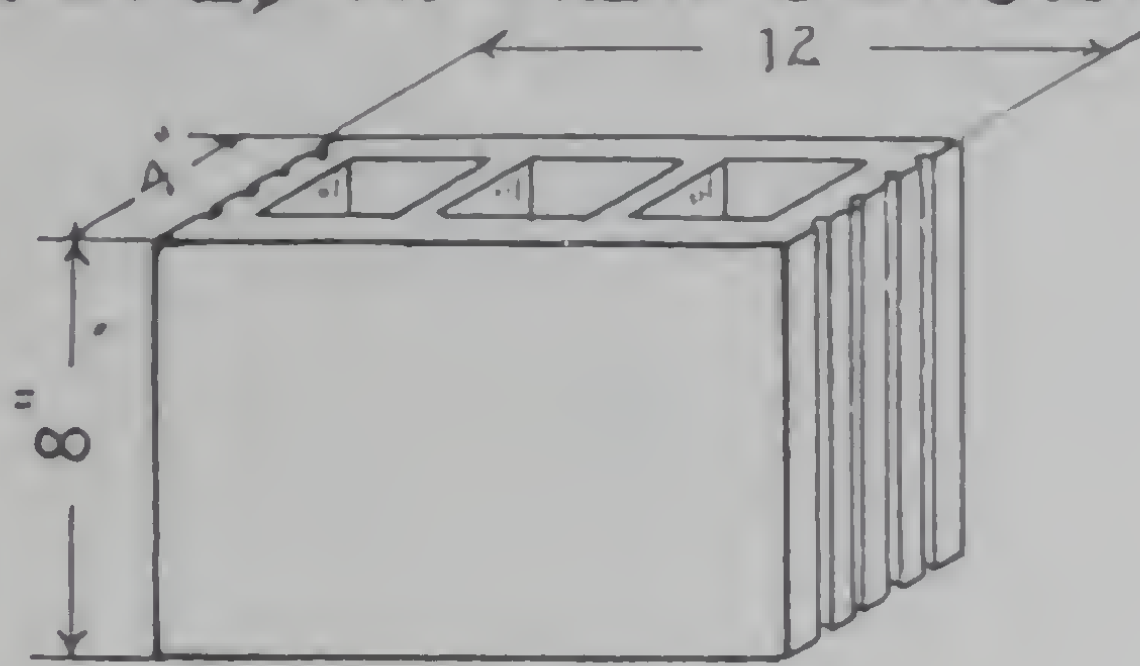


# DETAILS OF SMOOTH BUILDING TILE

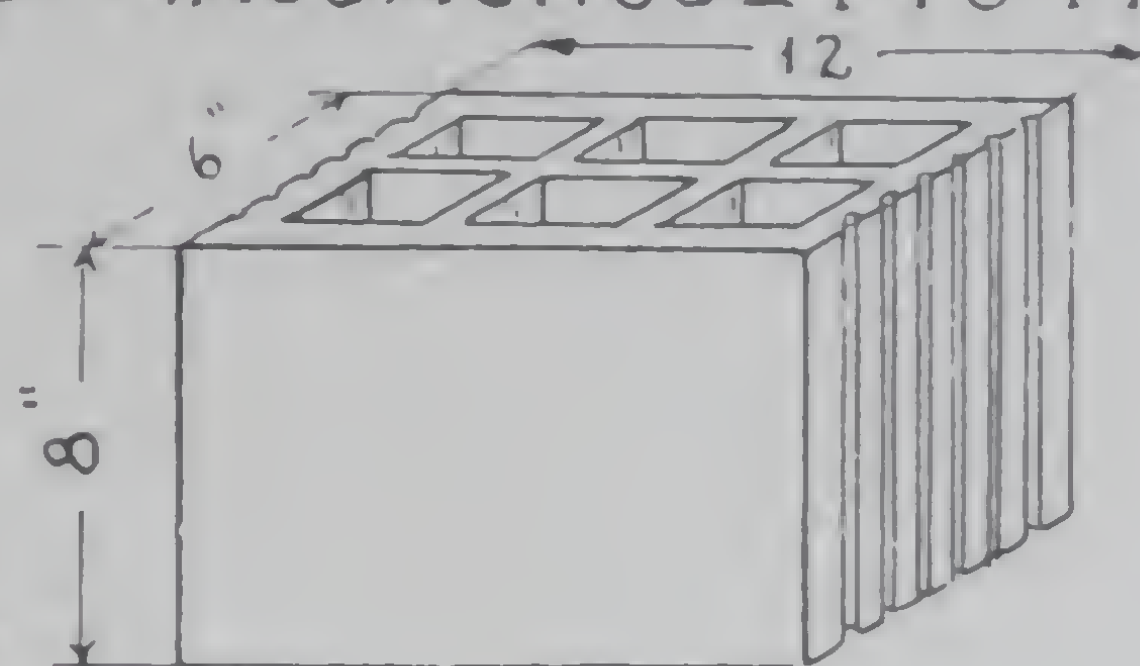
MANUFACTURED AT NEW JERSEY AND MASSACHUSETTS FACTORIES



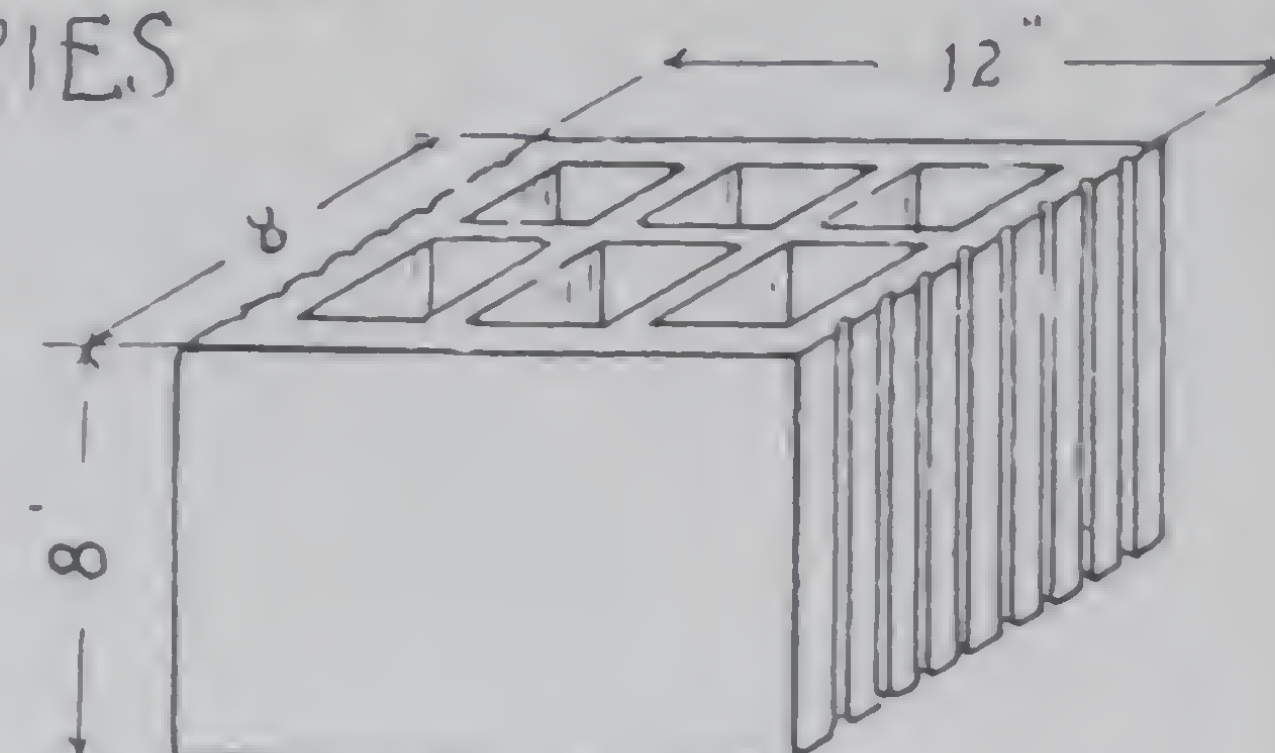
3" WALL TILE



4" WALL TILE

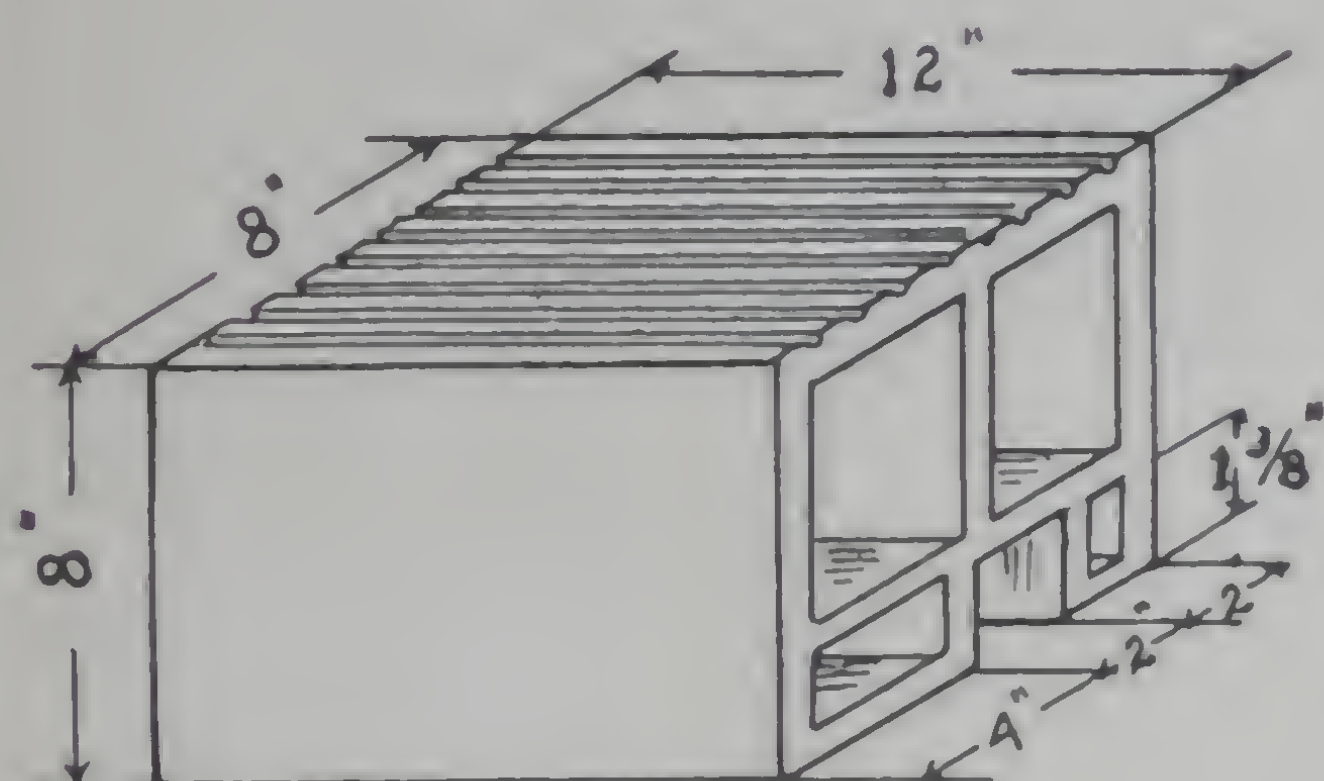


6" WALL TILE

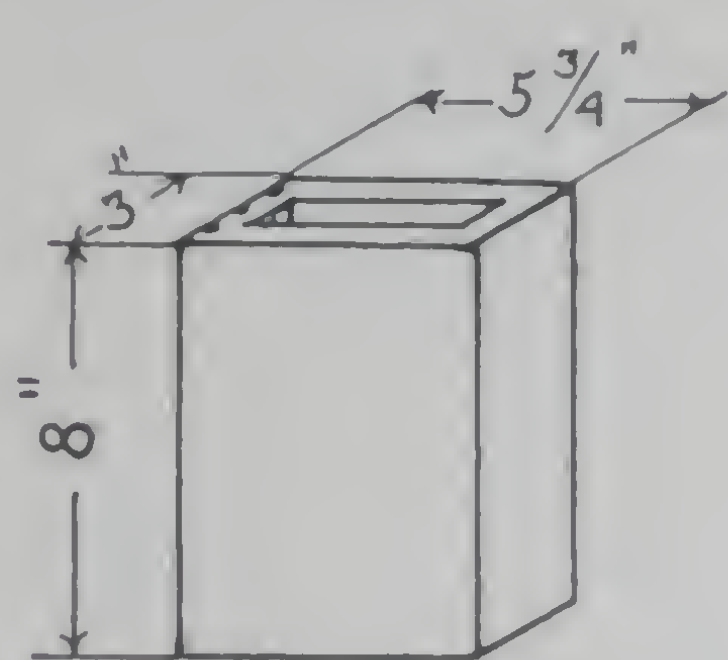


8" WALL TILE

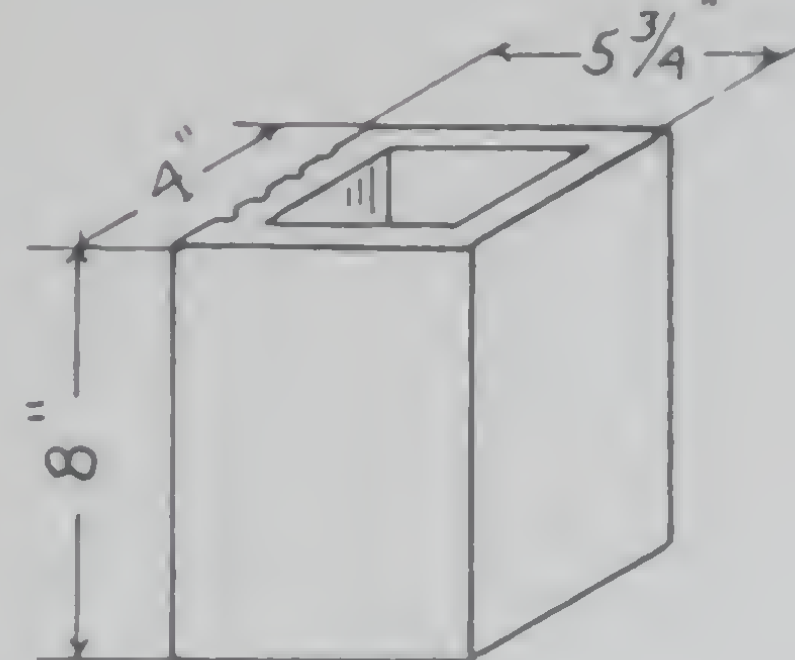
Note: 3", 4", 6", and 8" Closure Tile same as Wall Tile with one end smooth.



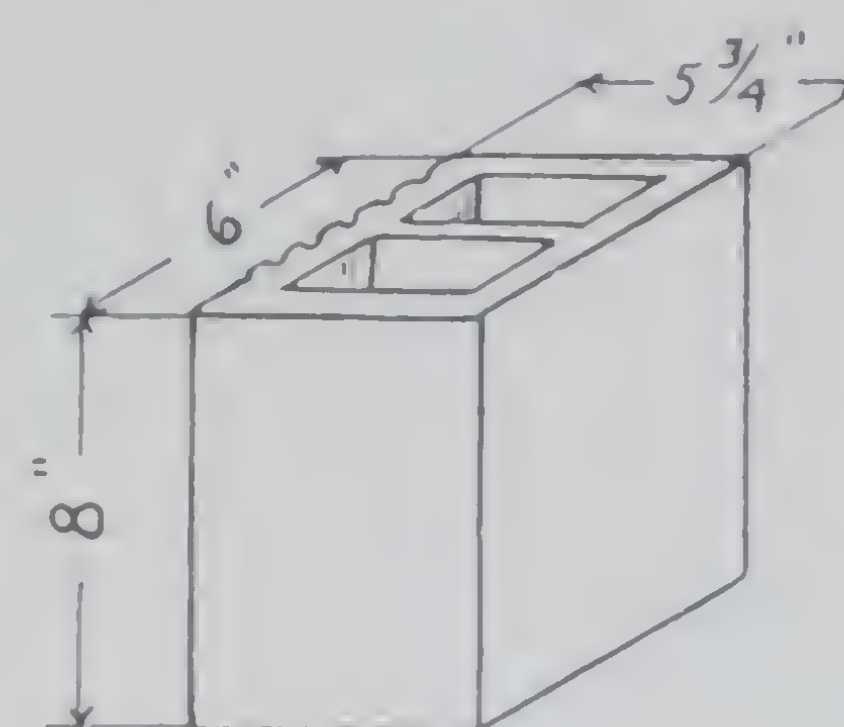
8" LINTEL TILE



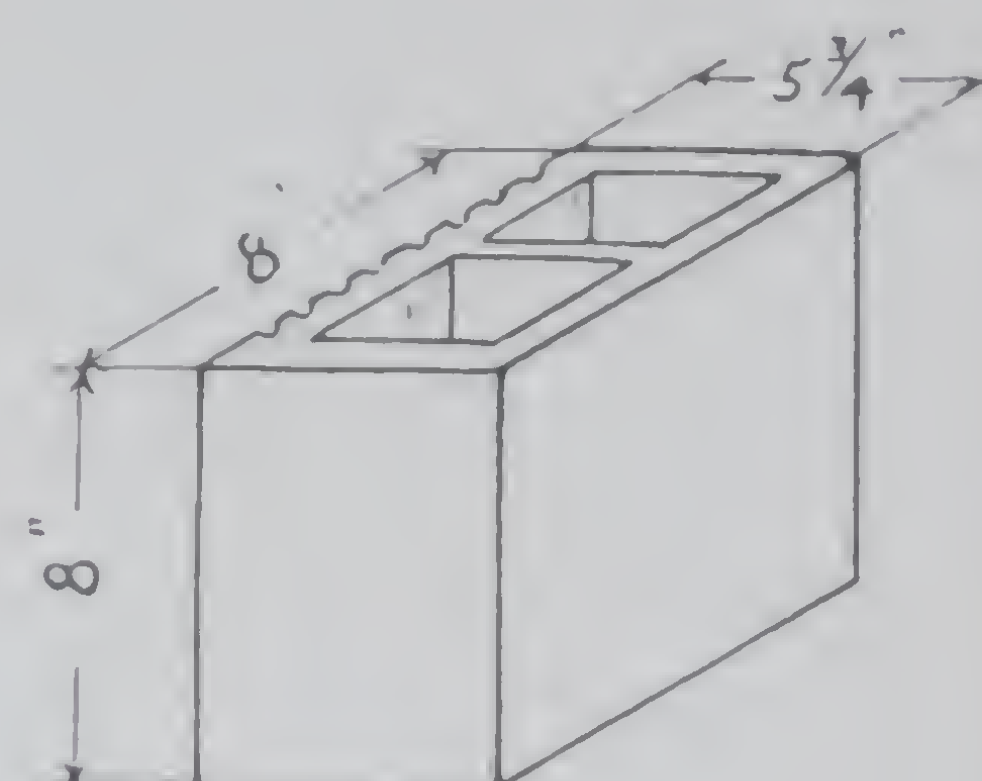
3" HALF CLOSURE



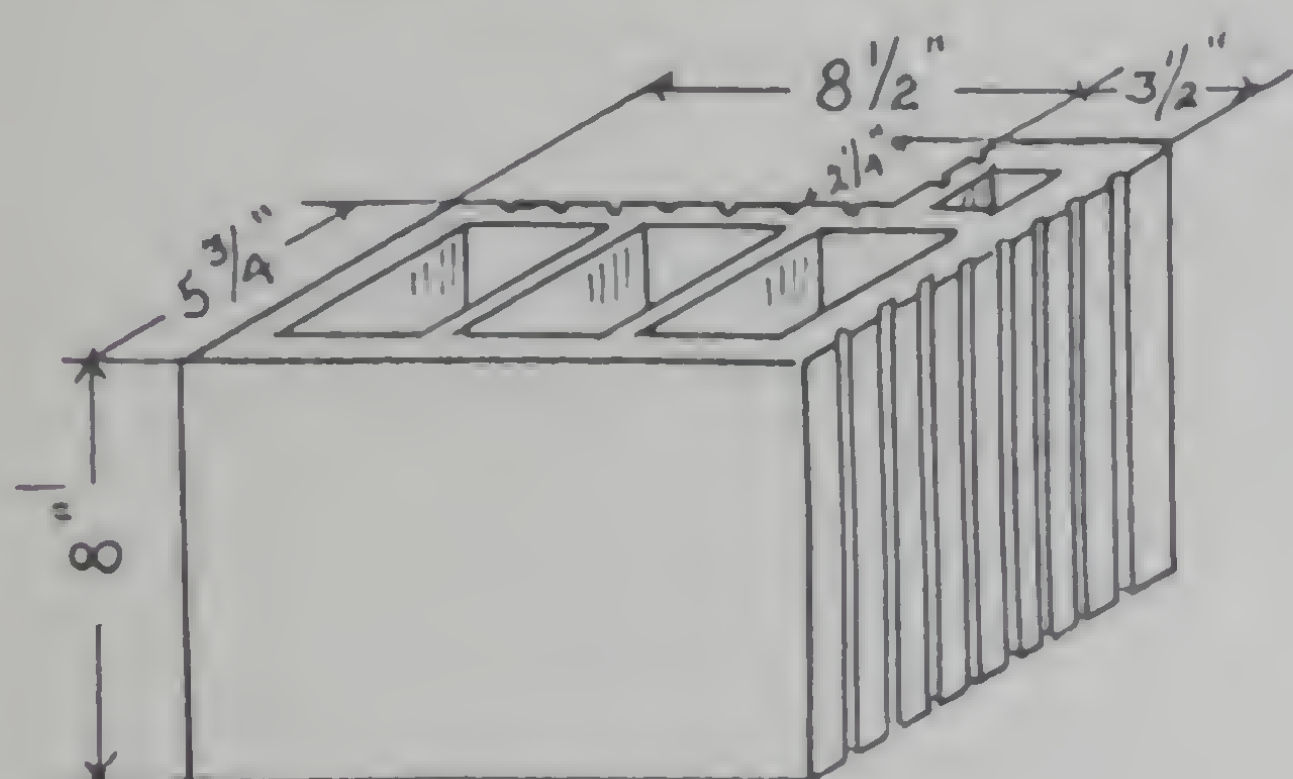
4" HALF CLOSURE



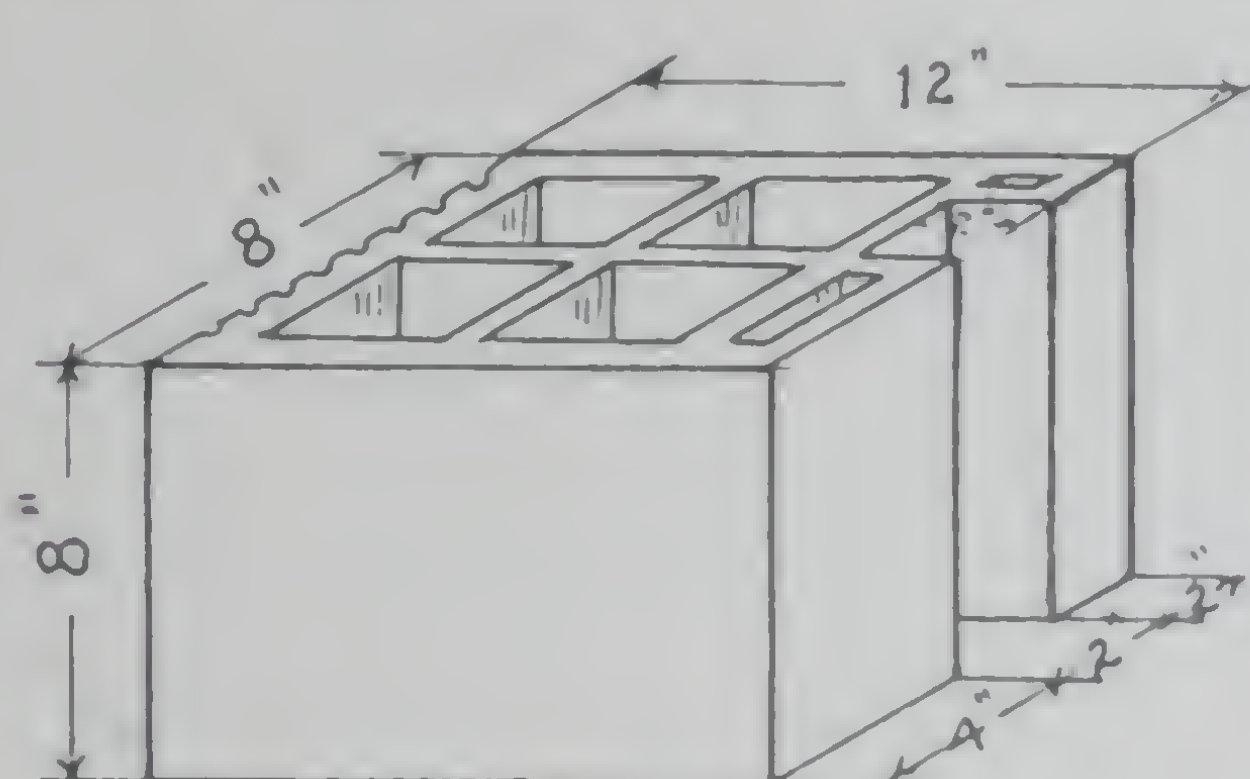
6" HALF CLOSURE



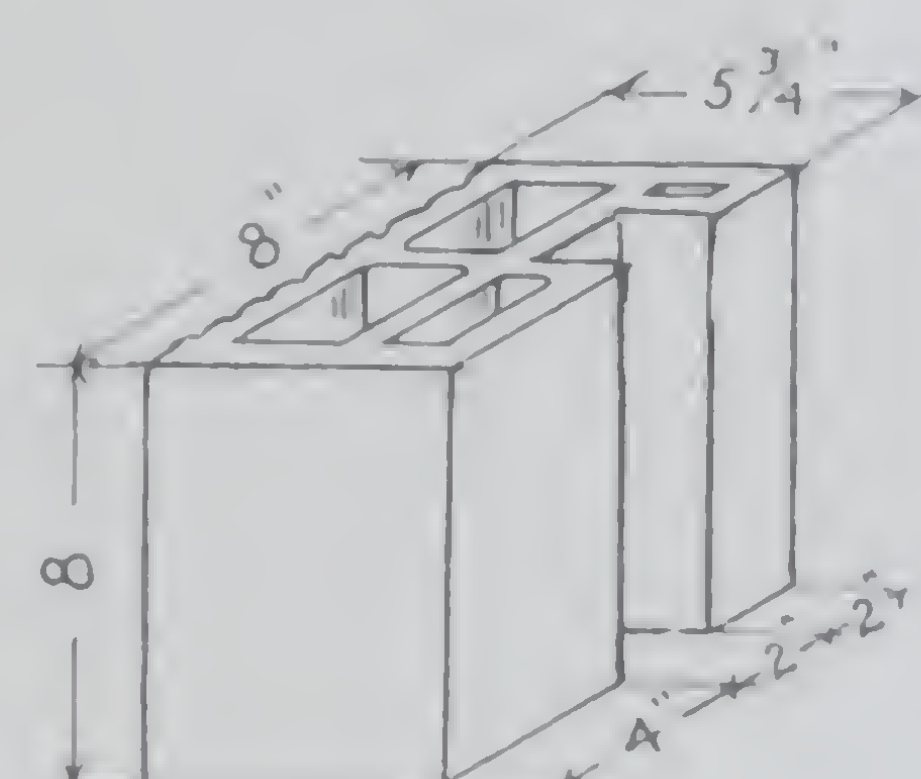
8" HALF CLOSURE



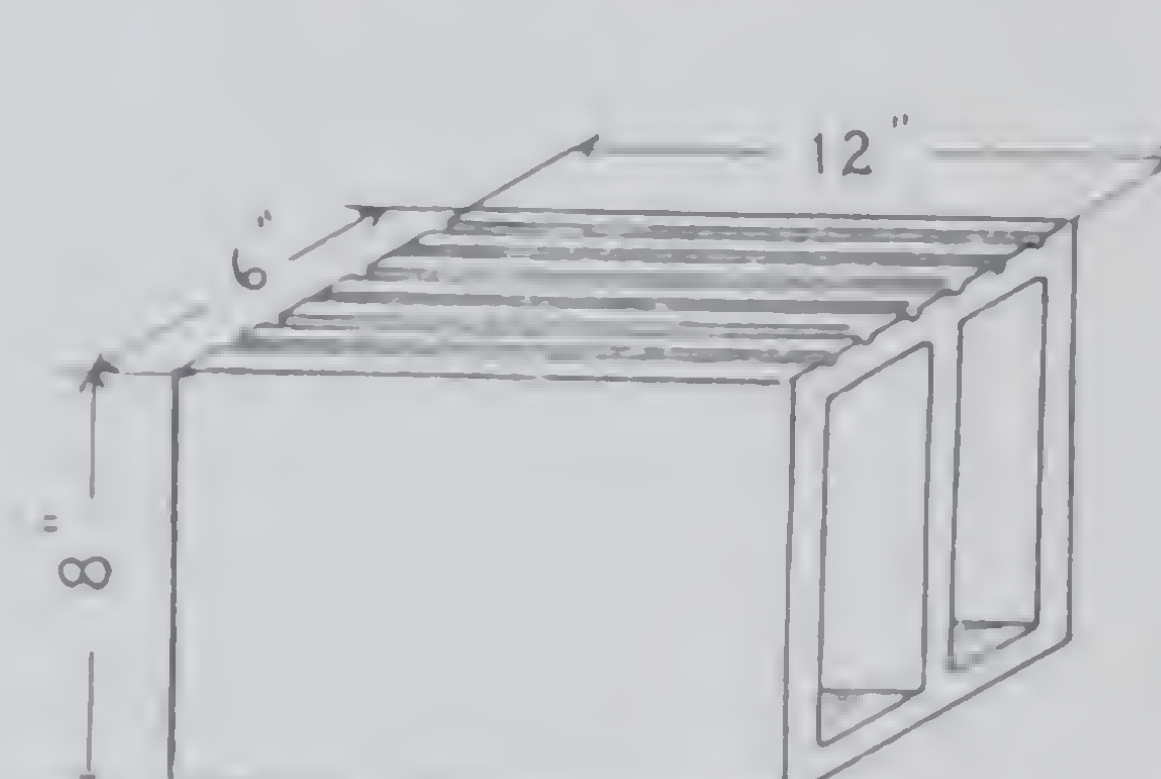
8" CORNER TILE



8" JAMB TILE



8" HALF JAMB



6" LINTEL TILE

## Natco Smooth Building Tile

(Illustrated by details above)

This NATCO product was developed and has been used successfully to meet a large demand for a hollow tile unit with a smooth face for factories, railroad warehouses, farm buildings, etc. It is adapted, especially, to panel or curtain walls between reinforced concrete piers or columns. In the 8" size, jambs and lintels for standard steel sash can be furnished.

For bearing walls, the NATCO XXX design or NATCO Double Shell tile should always be used, however.

The 12" x 8" face of this tile is more pleasing to the eye than a 12" x 12" face which has been used at times, and is more easily handled and laid than the larger, heavier tile. Also, they are cheaper to lay than the 5" x 12" tile (used for the best appearance), and are entirely satisfactory when laid with neatly struck joints and washed down with a weak solution of acid after completion.

Red or black mortar joints add greatly to the appearance of the wall.

1. SIZES—3" x 12" x 8" for walls 3" thick  
4" x 12" x 8" for walls 4" thick  
6" x 12" x 8" for walls 6" thick  
8" x 12" x 8" for walls 8" thick

When ordered, a proper proportion of half blocks is shipped to break joints. Special shapes to build complete walls are illustrated above.

2. TYPES—UNGLAZED. These are of variegated buff color, run of kiln and are for general use. They can be made in light reddish color, one face tex finished and the other face smooth or scored.

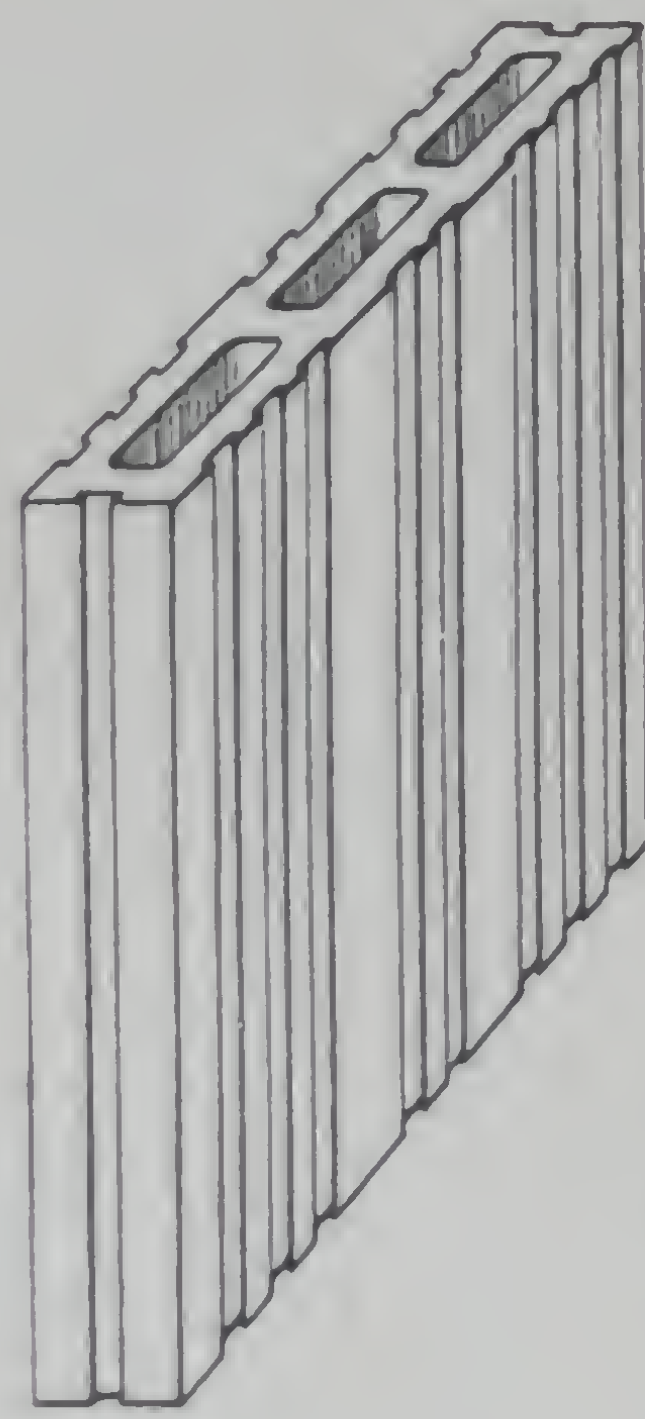
GLAZED. These are of a very dark brown or chocolate color and are only used for special purposes, such as to resist acid fumes or where the tile must be impervious to moisture, in which case they should be laid up with waterproof mortar.

3. In designing height of window and door openings, remember to make these dimensions a multiple of 8 1/2 inches, which allows for 1/2-inch mortar joints.

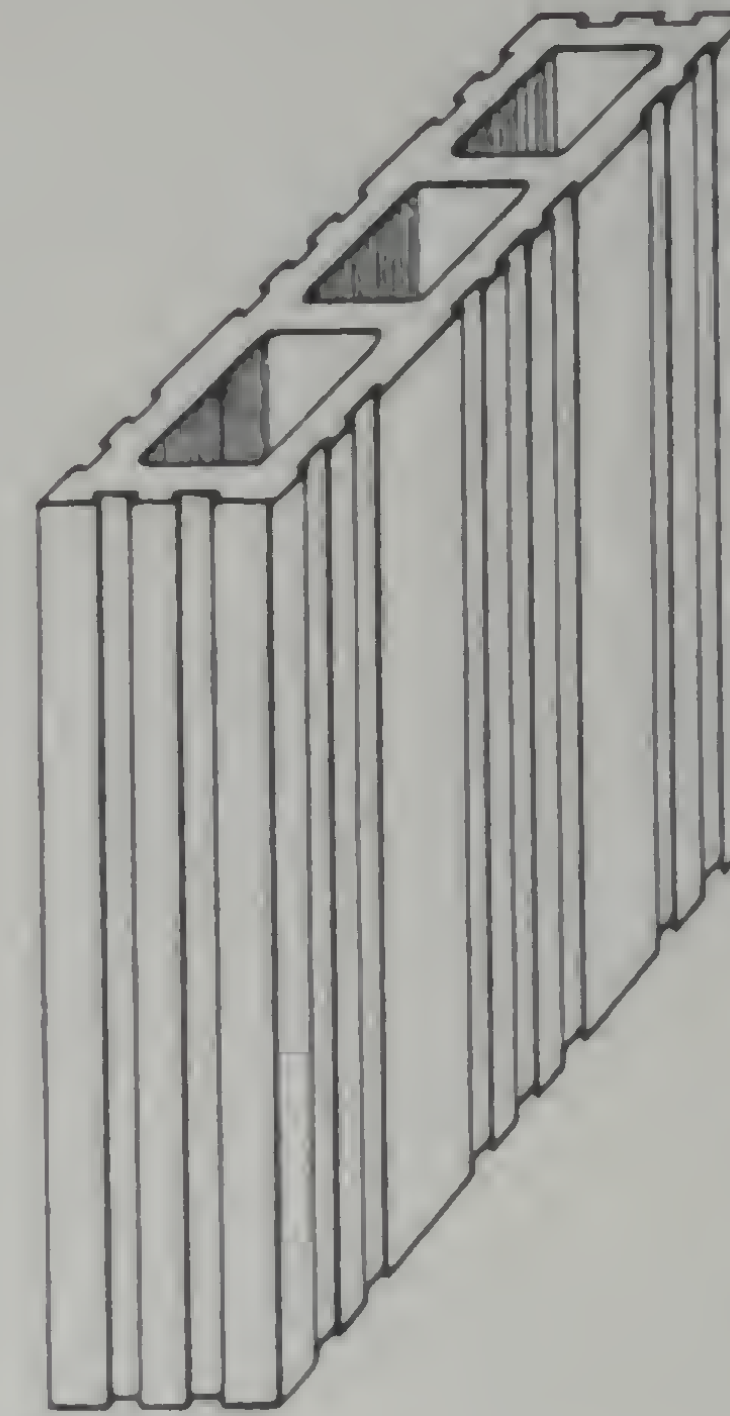
4. These tile are principally used in the territory tributary to our eastern factories.



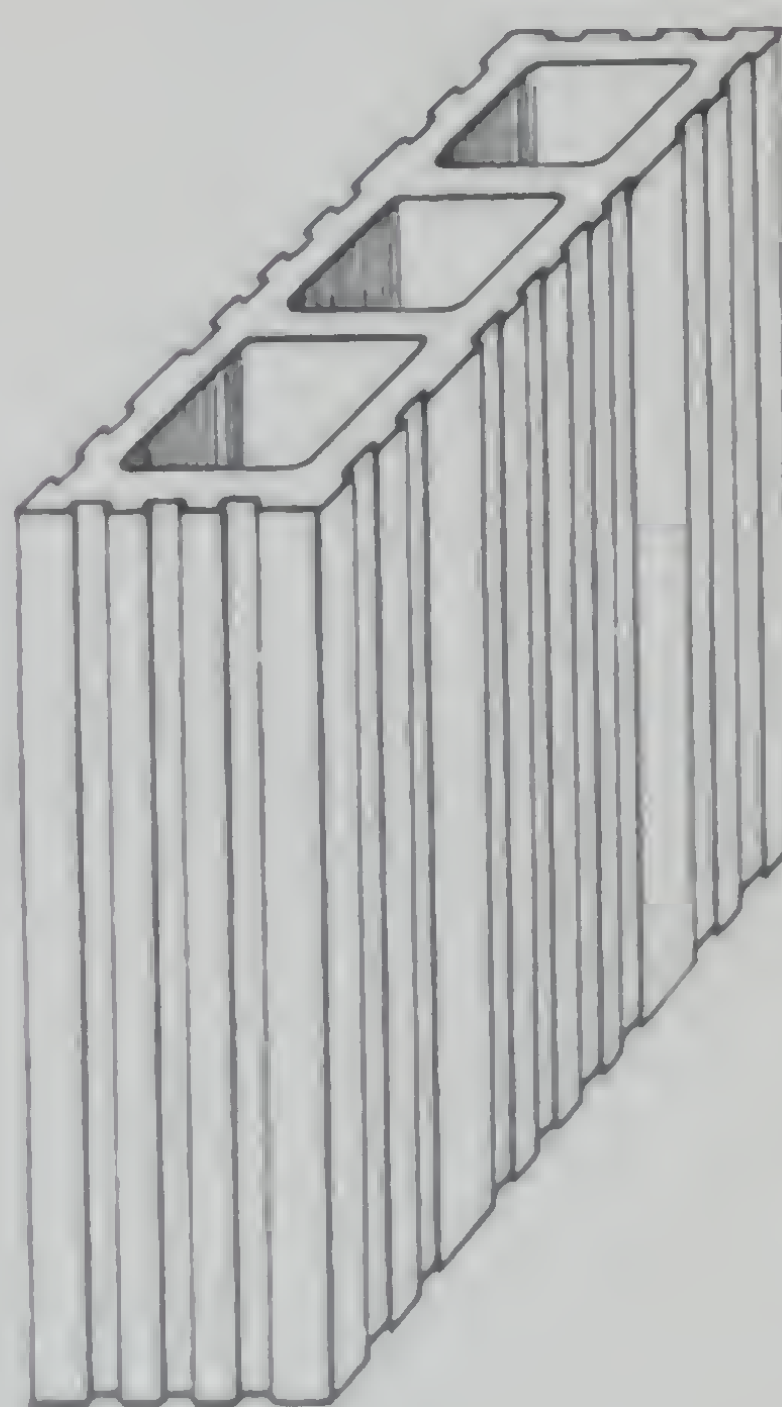
## Standard Natco Partition Tile



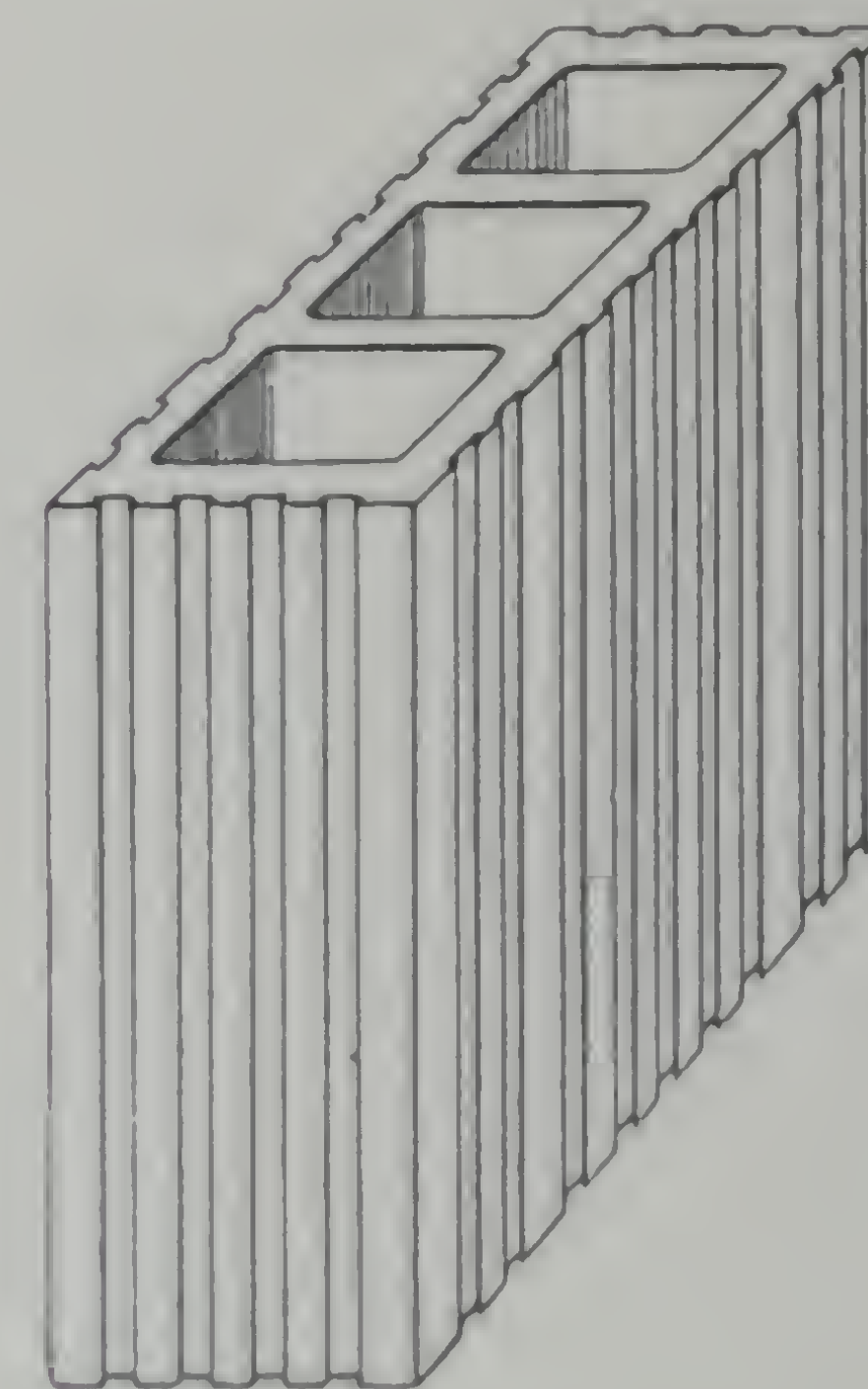
Eastern Factories  
2-cell—2x8x12—10 lb.  
Ohio Factories  
3-cell—2x12x12—15 lb.  
Western Factories  
3-cell—2x12x12—15 lb.



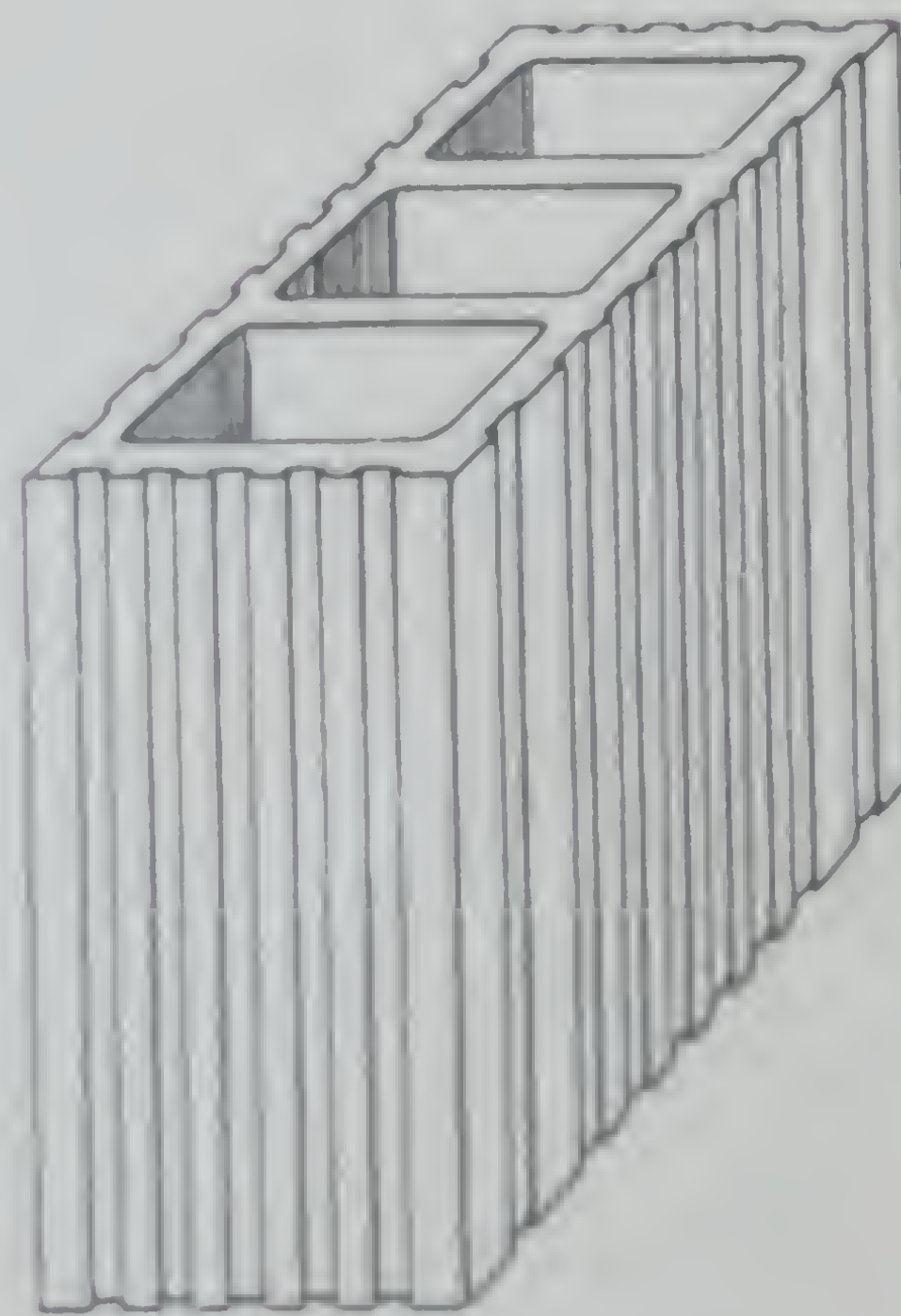
3x12x12  
Eastern Factories  
3-cell—15 lb.  
Ohio Factories  
3-cell—15 lb.  
Western Factories  
3-cell—15 lb.



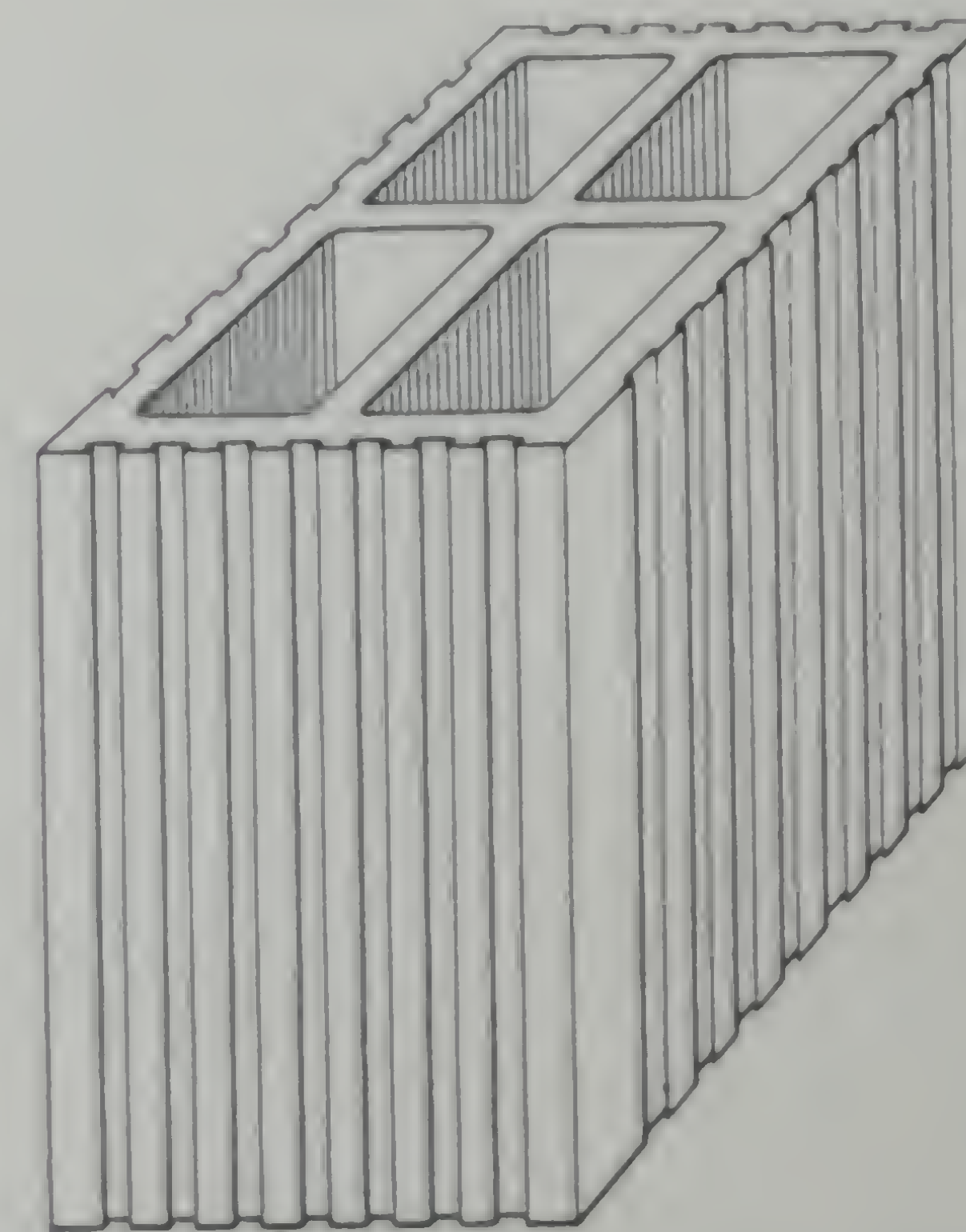
4x12x12  
Eastern Factories  
3-cell—16 lb.  
Ohio Factories  
3-cell—16 lb.  
Western Factories  
3-cell—16 lb.



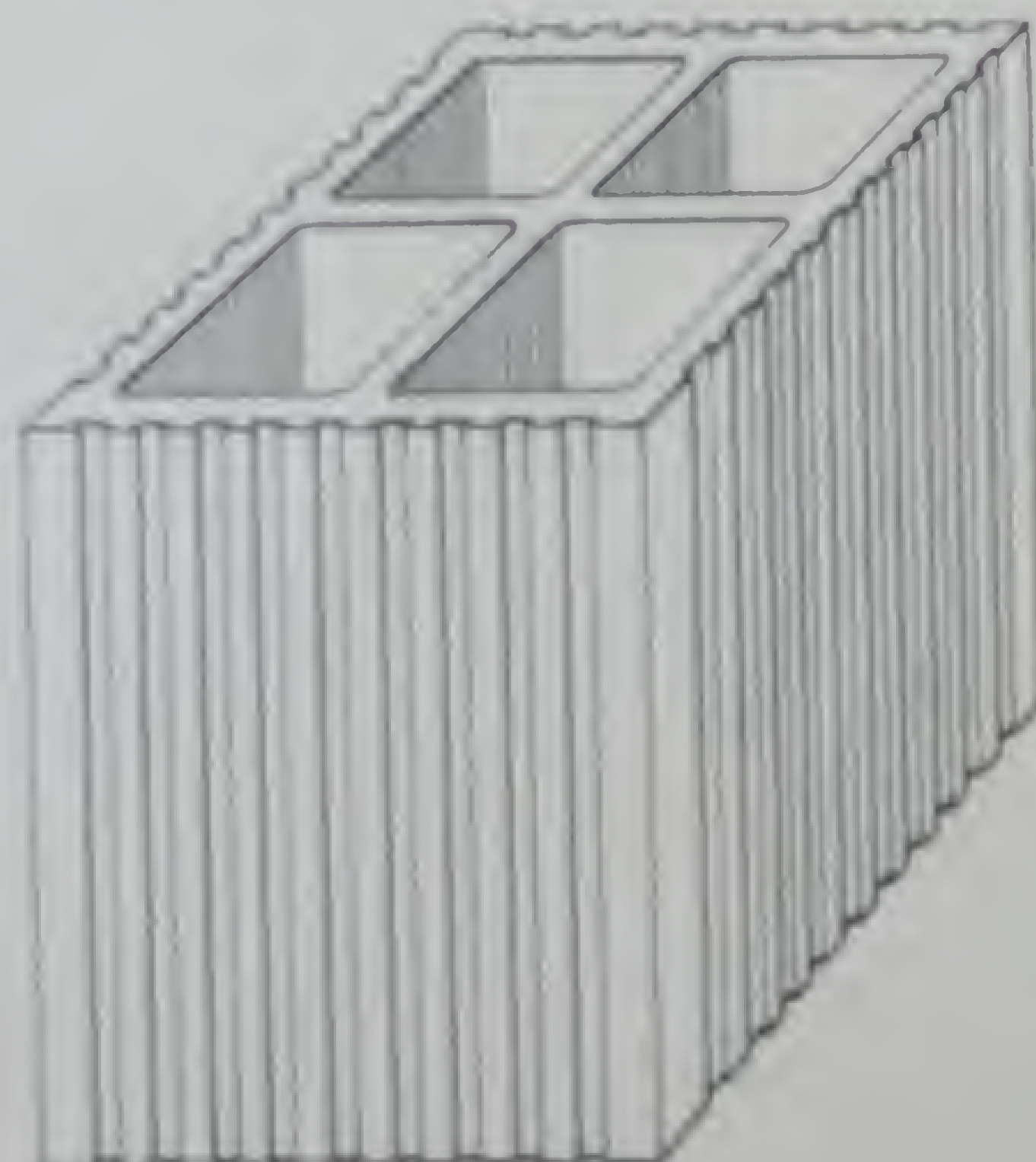
5x12x12  
Eastern Factories  
6-cell—22 lb.  
Ohio Factories  
3-cell—19 lb.  
Western Factories  
3-cell—19 lb.



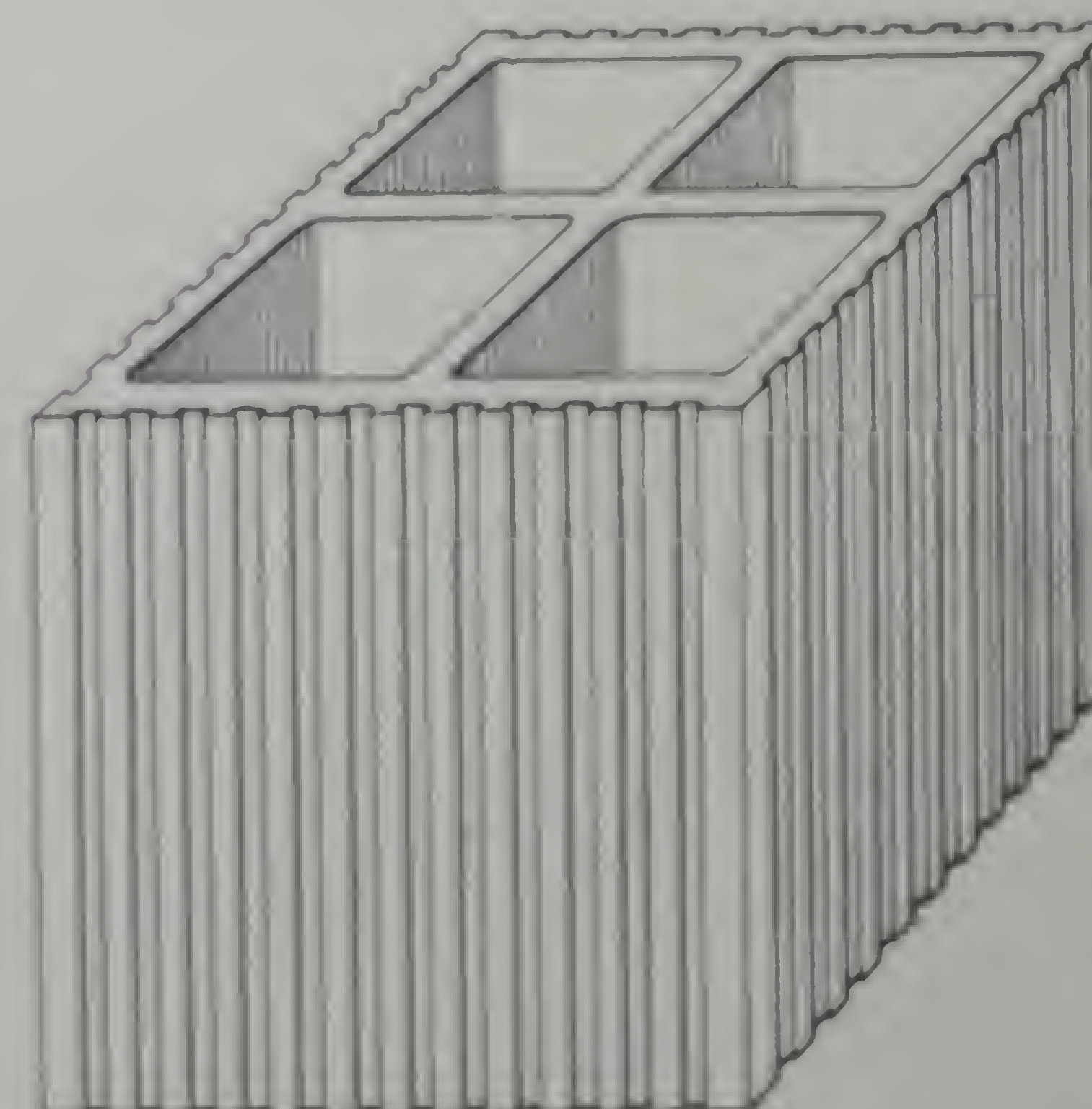
6x12x12  
Eastern Factories  
6-cell—24 lb.  
Ohio Factories  
3-cell—22 lb.  
Western Factories  
3-cell—22 lb.



8x12x12  
Eastern Factories  
6-cell—30 lb.  
Ohio Factories  
4-cell—30 lb.  
Western Factories  
6-cell—30 lb.



10x12x12  
Eastern Factories  
6-cell—36 lb.  
Ohio Factories  
4-cell—36 lb.  
Western Factories  
6-cell—36 lb.



12x12x12  
Eastern Factories  
6-cell—40 lb.  
Ohio Factories  
4-cell—40 lb.  
Western Factories  
6 cell—40 lb.

### STANDARD SIZES AND APPROXIMATE WEIGHTS OF PARTITION TILE

Weights given are for estimating purposes and are approximate only







